

JUN 18 1928

Vol. 25, No. 6

PSYCHOLOGICAL REVIEW PUBLICATIONS

June, 1928

# Psychological Bulletin

EDITED BY

SAMUEL W. FERNBERGER, UNIV. OF PENNSYLVANIA

HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)RAYMOND DODGE, YALE UNIVERSITY (*Monographs*)MADISON BENTLEY, UNIVERSITY OF ILLINOIS (*J. of Exp. Psych.*)WALTER S. HUNTER, CLARK UNIVERSITY (*Index*)HERBERT S. LANGFELD, PRINCETON UNIVERSITY, *Business Editor*

WITH THE CO-OPERATION OF

G. W. ALLPORT, DARTMOUTH COLLEGE; B. T. BALDWIN, UNIVERSITY OF IOWA;  
J. E. COOVER, STANFORD UNIVERSITY; W. T. HERON, UNIVERSITY OF MINNESOTA;  
K. S. LASHLEY, CHICAGO, ILL.; M. F. MEYER, UNIVERSITY OF MISSOURI; R. M.  
OGDEN, CORNELL UNIVERSITY; R. PINTNER, COLUMBIA UNIVERSITY; E. S.  
ROBINSON, YALE UNIVERSITY.

## CONTENTS

### General Reviews and Summaries:

*Psychology in Industry*: M. S. VITELES, 309. *The Thyroid Gland*:  
J. G. ROCKWELL, 341.

*Special Reviews*: 361.

*Books Received*: 375.

*Notes and News*: 376.

PUBLISHED MONTHLY

FOR THE AMERICAN PSYCHOLOGICAL ASSOCIATION

BY THE PSYCHOLOGICAL REVIEW COMPANY

372-374 BROADWAY, ALBANY, N. Y.

AND PRINCETON, N. J.

Entered as second-class matter at the post-office at Albany, N. Y., September 28, 1923

# **Psychological Review Publications of the American Psychological Association**

EDITED BY

HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)  
MADISON BENTLEY, UNIVERSITY OF ILLINOIS (*J. of Exp. Psych.*)  
RAYMOND DODGE, YALE UNIVERSITY (*Monographs*)  
SAMUEL W. FERNBERGER, UNIV. OF PENN. (*Bulletin*)  
WALTER S. HUNTER, CLARK UNIVERSITY (*Index*)  
HERBERT S. LANGFELD, PRINCETON UNIVERSITY, BUSINESS EDITOR.

WITH THE CO-OPERATION OF  
MANY DISTINGUISHED PSYCHOLOGISTS

## **PSYCHOLOGICAL REVIEW**

containing original contributions only, appears bi-monthly, January, March, May, July, September, and November, the six numbers comprising a volume of about 480 pages.

## **PSYCHOLOGICAL BULLETIN**

critical reviews of books and articles, psychological news and notes, university notices, and announcements, appears monthly, the annual volume comprising about 720 pages. Special issues of the BULLETIN consist of general reviews of recent work in some department of psychology.

## **JOURNAL OF EXPERIMENTAL PSYCHOLOGY**

containing original contributions of an experimental character, appears bi-monthly, February, April, June, August, October, and December, the six numbers comprising a volume of about 480 pages.

## **PSYCHOLOGICAL INDEX**

is a compendious bibliography of books, monographs, and articles upon psychological and cognate topics that have appeared during the year. The INDEX is issued annually in May, and may be subscribed for in connection with the periodicals above, or purchased separately.

## **PSYCHOLOGICAL MONOGRAPHS**

consist of longer researches or treatises or collections of laboratory studies which it is important to publish promptly and as units. The price of single numbers varies according to their size. The MONOGRAPHS appear at irregular intervals and are gathered into volumes of about 500 pages.

## **ANNUAL SUBSCRIPTION RATES**

Review: \$5.00 (Foreign, \$5.25). Review and Bulletin: \$9.50 (Foreign, \$10.00).  
Journal: \$5.00 (Foreign, \$5.25). Review and Journal: \$9.00 (Foreign, \$9.50).  
Bulletin: \$5.50 (Foreign, \$5.75). Journal and Bulletin: \$9.50 (Foreign, \$10.00).  
Any of above with Index: \$1.50 additional.  
Review, Bulletin, and Journal: \$14.00 (Foreign, \$14.75).  
Review, Bulletin, Journal and Index: \$15.00 (Foreign, \$15.75).  
Current Numbers: Review or Journal, \$1.00; Bulletin, 60c; Index, \$2.00.  
Psychological Monographs: \$6.00 per volume (Foreign, \$6.30).  
Current Issues: prices vary according to size.

---

Subscriptions, orders, and business communications may be sent direct to the

**PSYCHOLOGICAL REVIEW COMPANY  
PRINCETON, N. J.**

Vol. 25, No. 6

June, 1928

THE  
PSYCHOLOGICAL BULLETIN

---

PSYCHOLOGY IN INDUSTRY<sup>1</sup>

BY MORRIS S. VITELES  
*University of Pennsylvania*

In November, 1926, the writer published a review of the more important titles on psychology in industry appearing up to April, 1926 (171). In the present article are reviewed publications in this field appearing between April and December, 1926, inclusive, making it possible to include hereafter in an annual review material published from January to December of a given year. In the present review, as in the one referred to above, the practice has been followed of limiting reference to books specifically devoted to the application of psychology in industry and to articles in this field appearing in the technical journals.

VOCATIONAL SELECTION

*I. General*

Among major contributions on the application of psychology in the selection of workers is a volume on employment psychology by Burtt (42). This represents the most comprehensive survey of material and methods for scientific selection published to date. Its inclusiveness and its unbiased, almost uncritical presentation of material, accomplishments, techniques, and points of view make it particularly suitable as a text for students in courses in vocational psychology. Psychological tests of vocational aptitude, trade tests, rating scales, other determinants of vocational aptitude, statistical methods, etc., are

<sup>1</sup> The author is indebted to Clarence McKelvie, a student at the University of Pennsylvania, who assisted in assembling the bibliography for this review.

treated with a combined thoroughness and simplicity that make the volume outstanding among those in this field. A very complete bibliography, a chapter on history, and another on pseudo-scientific methods contribute to the completeness of this book. Freyd's valuable description of research procedure published in 1923 has been elaborated into a book by Bingham and Freyd (31). The addition of descriptive material on psychological tests, a chapter on rating scales, more detailed discussion of the various steps in devising tests for use in selection, a number of illustrative charts, a more comprehensive bibliography, and an appendix of statistical tables combine to make this operating manual more useful than ever. In a second edition of the volume by Tead and Metcalf (160) on Personnel Administration a chapter is devoted to a brief and judiciously conservative statement on the place of psychological tests in the selection program.

Among foreign publications is a discussion of the problems and basic principles of vocational testing to which a number of German psychologists and administrative officials contribute (53). A portion of a volume on psychotechnology by Walther (176) is given over to a summary of methods employed in analyzing jobs and in constructing and applying tests in selecting workers. Of special interest is the citation of results from work done by the author in factories in Switzerland. However, in view of the importance of the volume as one of the few authoritative publications in French, the general discussion on vocational selection must be described as sketchy and, on the whole, as not particularly enlightening.

These larger, more general contributions to vocational selection are supplemented by a number of shorter articles and monographs of general interest, *i.e.*, devoted primarily to history, theory, administrative problems, etc., rather than to detailed description of original experimental studies.

Among these are a few *historical* accounts of developments in vocational selection. A brief survey of testing activities in European countries other than Germany, France, and England are found in concise reports in *Industrielle Psychotechnik*, notably in a recent report of the *Internationalen Vereinigung für Psychologie und Psychotechnik* (5).

References to European investigations are found in an article by Walther (175) describing the benefits of scientific selection and in briefer statements by Moede (117) and Viteles (170).

The present status of industrial selection in Germany is strikingly presented in the form of a table giving the names of organizations using psychological tests, the year in which testing was started, the jobs for which examinations are made, the number of applicants tested annually, etc. (4) Current investigations in vocational testing in Germany are also referred to by Lipmann (106) in a short account of developments in industrial psychology in that country.

Recent English studies on selection are mentioned in reports of the *National Institute of Industrial Psychology* (15, 16) and in a monograph by Stott (154).

Japanese advances in the same field are reported by Uyeno (168).

Of interest as an account of projects in vocational selection is an article by Telford (161) on the activities of the *Bureau of Personnel Administration*.

Underlying theory and administrative problems occupy prominent places in a number of articles. The individual and social significance of scientific selection in industry and the specialized techniques of vocational testing are briefly and interestingly discussed in non-technical terms in an article by Burtt (43). The importance of a closer study of the physical and mental requirements of the job and of careful selection as factors in modern industrial organization are stressed by Miles (115) in a discussion of the characteristics of effective organization.

That selection tests should be employed merely as diagnostic tools in the hands of experts is the thesis of Anderson (1) in a discussion of the place of psychiatry in industry. The emphasis on the importance of interpreting test results in the light of complete data concerning the applicant is well placed, and has been likewise stressed by the reviewer elsewhere (173, 174). However, that the psychiatrist is either by training or outlook best prepared to interpret test results in relation to other data gathered in the course of a clinical interview of an applicant for employment is, to say the least, a moot question. The article illustrates the tendency among psychiatrists to make "psychiatric" synonymous with "clinical" in the discussion of methods.

Spielman (152) outlines the steps to be taken and precautions to be observed in devising tests for vocational selection in an article which can be of no service to either the student or the trained worker in industry and of little interest to the layman. In contrast with the latter in effectiveness and usefulness is the description of factors to

be considered in constructing tests forming part of a report by O'Rourke (122).

Heydt (81) describes the results of a *follow-up*, over a period of six years, of apprentices in railway work shops and outlines the conditions necessary for the satisfactory evaluation of tests of occupational aptitude. The problem of follow-up in vocational selection is likewise discussed by Hildebrandt (82), who illustrates both the importance and technique of follow-up in a study of ratings by departments heads, of quantity and quality of production, and of turnover in a group of apprentices in the metal trade. The article is of significance not only as an example of a thoroughgoing evaluation of tests, but also by reason of the author's application and discussion of diverse criteria of accomplishment. Work shop practice as a standard of vocational success is carefully analyzed by Hildebrandt and Borsig (83), who, from a critical survey of the investigations of others, and on the basis of the results of an experimental study of the quantity and quality of work done by twenty-four apprentices on diverse operations, draw thoughtful conclusions on the unreliability of the short period of employment as a criterion; on the necessity for analyzing the job into its component parts, and on other problems in the development of criteria and in the formulation of points of view and of method in vocational testing.

The importance of satisfactory criteria of vocational accomplishment are discussed by Bingham (29) in a paper embodying material from various sources, as well as in a paper by Viteles (172). A valuable by-product of a report by Bills (28) on measuring office output is suggestive material on criteria for the construction of tests for office workers.

The growing interest of psychologists in the measurement of temperamental or personality traits is reflected in the literature of vocational testing. The extreme significance of character traits (as distinct from abilities) in vocational testing and adjustment is emphasized by v. Foerster (61), who briefly discusses the sundry approaches (psychiatric, psychological, graphological, etc.) in the analysis and measurement of these elusive traits. Of particular interest in this connection is a summary, in a later article by the same author (62), of an investigation in the textile trade by Mevius, leading to a classification into personality types of competent and incompetent weavers following a psychiatric examination which involved, among other things, an application of the Kretschmer principles on

the relationship between character and body form. Although recognizing the defects in a method so subjective as that employed in the study, v. Foerster is inclined to grant its usefulness in the elimination of the extremely unfit in industry.

The vocational significance of differences in degree of introversion is stressed in a characteristically well written article by Bingham (30), who attributes its significance to the development, through the disproportionate exercise of introversion, of an interest and of the ability in dealing with mechanisms and ideas at the expense of interest and proficiency. The significance of introversion and extroversion for vocational selection are also discussed by Laird (101) in an article describing a test for the measurement of these traits. The chief value of the article lies in its pithy analysis of the nature of these traits and in the discussion of the industrial problems growing out of their existence.

Earlier experiments and conclusions on the relation between interest and ability are succinctly summarized by Uhrbrock (166), the results of whose investigation of the differences in intelligence among college students interested in "things," "ideas," and "people" demonstrate the importance stressed by Bingham of exercising restraint in the immediate practical utilization of such measures of interest as are available for purposes of vocational selection and vocational guidance. Further experimental results on the place of interest in vocational adjustment are presented by Cowdery (49) and Strong (156, 157). The latter makes a plea for a diversion from the attempt to predict vocational aptitude by the measurement of abilities to the measurement of the "totality of mental set" as determined by "traits" reflected in likes and dislikes. The validity of assumptions accepted by the author in recommending this substitution remains to be demonstrated.

Bolton (34) cites examples from factory and stage in pointing out the significance of instinct, as reflected in the emotions, in vocational success and failure.

The possibility and desirability of influencing the subject's attitude, in the course of vocational testing, in the direction of speed or accuracy is experimentally investigated by Hunn (86), who finds that the possibility of determining attitude is extremely limited in the measurement of acquired skill such as that represented in typewriting.

*II. Experimental Studies in Vocational Selection*

(A) *Tests for Skilled and Semi-Skilled Workers.* In the investigation of aptitude for factory work Germany continues in the lead. The single American contribution, during the period of this review, in the determination of the aptitudes of apprentices is a study by Crockett (50), the chief merit of which is the recognition of the negative character of the results. The combination of highly subjective criteria (in a field of work in which more objective criteria should be readily available), of a small number of cases and of statistical methods of doubtful value contrive to diminish the importance of this contribution.

Although no new studies on apprentices are reported in German periodicals, the articles by Hildebrandt and Borsig (82, 83), to which reference has already been made, furnish evidence of continued interest in this direction, as well as examples of the painstaking analysis of the validity of selection tests which is growing to be characteristic of the more recent, in contrast with the earlier German investigations on industrial selection.

Further evidence of interest in tests for skilled factory workers is to be found in the publication of a second edition of the monograph by Lipmann and Stoltzenberg (107) on the selection of skilled workers for the metal trades. Bound with this is a report by Streller (155) giving further data on the Lipmann-Stoltzenberg tests. The description of a movable laboratory for testing metal trade apprentices in Czechoslovakia, described by Schulhof (145), gives another indication of the prevalence of psychological examinations for apprentices in Europe. Tests for ability to work rhythmically are given by Reinhardt (136) to a group of apprentices as part of an investigation on the influence of rhythm on production.

Other factory occupations have been the subjects of a number of experimental studies. Biegeleisen (26) reports on the use of tests for the assignment of workers to the various machines in a wood working shop. The effect of such variables as changes in organization paralleling the use of tests is neglected by the author in explaining an increase in production and an improvement in the quality of work. These he ascribes solely to the employment of imperfectly standardized and evaluated psychological tests. In a later article (27) the contribution of these other variables is analyzed and the conclusion again drawn, from this analysis and from the indications of

further follow-up, that the greater efficiency of production must be entirely referred to improved selection of workers. The fact that increased efficiency often follows solely from a reduction of force, one of the variables in the situation, receives no attention by the author.

Tests for the selection of shoemakers are described by Mayer and Sterzinger (112). Packers in a chemical plant are the subjects of an investigation by Eberle (57). Test results show a satisfactory correlation with supervisors' judgments after six months of employment. Noteworthy is the care which the author exercises in refining and correcting this generally unsatisfactory criterion. The findings of another investigation on packers is reported by Walther (176), who also describes the satisfactory results of tests given to workers in a paper bag factory.

Rossmann (138) describes tests used in the selection of workers for the textile industry. On the basis of a follow-up of 600 workers that is outstanding as an example of unreliable procedure in test evaluation the author concludes that the tests have been eminently satisfactory in the elimination of unfit workers. Pfenninger (127) furnishes an exhaustive analysis of the occupational qualifications of lay-out men and describes tests which have been tried out on only four such workers in a machine shop.

No high degree of relationship between general intelligence and the success of subnormal girls in the garment trade (machine operating) is found by Unger (167) in an account of an extremely significant and well reported experiment in training such girls. However, girls with I.Q.'s of less than 50 or a mental age of less than 8 are found to be unsuitable for this trade. A team of tests for predicting success in garment machine operating was developed in the course of this study and is to be described in another article. The relation between mental age and other mental factors in the adjustment of the feeble-minded in factory work and in other industrial jobs is further discussed by Burr (41).

Of interest to those working on the selection of factory employees is a report by Gleason (76) on a continuation of Patten's experiment in testing engine lathe aptitude. Tests for the selection of general machinists (149), automobile mechanics (9), carpenters (10), and electricians (11) are among a series of inadequately standardized and nonevaluated tests suggested for use by the *Bureau of Public Personnel Administration*.

(B) *Test for Office Occupations.* A survey of recent publications reveals few titles on the selection of office workers. That scores of a clerical test used by an insurance company increase with schooling but not with age, and that the average scores of men are higher than those of women are among the conclusions of an article by Dobbins (54). A somewhat more refined treatment of the significance of differences, etc., would have been desirable in this example of a necessary and often neglected treatment of industrial selection test data. The effect of enthusiasm unhampered by scientific acumen in the treatment of vocational test data is excellently illustrated in an attempted evaluation of the Thurstone Clerical Test by Weber and Leslie (179).

Shellow (146) finds a high correlation between an intelligence test for stenographers and rankings in proficiency. The validity of the criteria seems somewhat dubious, particularly in view of the knowledge, by the examiner who makes the proficiency ratings, of the performance of these stenographers on other standardized tests. The competitors in a typewriting contest and a control group of students of stenography are made the subjects of an investigation on the measurement of stenographical aptitude by Runge (139). The objectivity of the criteria, abundant and suggestive testing material, and conservatism in drawing conclusions are features of this study whose significance suffers, however, from an inadequacy in the number of cases. A high correlation is found between a selected battery of tests and the criteria of speed and accuracy in reproducing copied and dictated material. Tests for typists are described by Klockenberg (94) in a volume reporting experiments designed to uncover construction changes which could serve to increase the efficiency of the typewriter.

That scores on a general intelligence test are not directly predictive of a girl's success as a cashier, although chances for success are greater in the middle range of scores in this test, and that "almost anyone who has a real desire in that line can learn to be a successful cashier" are among the conclusions of a study sketchily outlined in an article by Pruette (133).

The supply of unstandardized tests for office workers is augmented by a series of suggested tests for senior account clerks (13).

(C) *Tests in the Selection of Transportation Employees.* Progress in the improved selection of transportation employees is reflected in the literature. Earlier experiments in the selection of motormen

are briefly reviewed by Keeling (89). He further describes in detail and critically discusses the experimental work with the Viteles Motorman Selection Test initiated by Viteles and carried on by Shellow. These studies receive favorable comment. Further data on the value of the same test is furnished by Shellow (147), who finds a considerably smaller proportion of terminations for accidents in a group of motormen tested prior to employment as compared with a group employed without such an examination. The possible influence of other variables seems to be adequately accounted for in this careful study. Another excellent feature of the same article is a discussion of the significance both for training and selection of the observation and analysis of test performance and of a supplementary clinical interview. The same data is included in a more popular article on this investigation by Dewhirst (52). A later modification of the Viteles Motorman Selection Test is described in an account of another research study by Viteles for further investigating the validity of this test (6).

The testing procedure for the selection of motormen developed by Lahy, in Paris, is briefly described and favorably commented upon by Pruette (132). Among recent German studies in the same field is an article by Rupp (141) on the selection of motormen in Austria and of chauffeurs in Germany. Largely on the basis of a subjective analysis of their favorable and unfavorable qualities he discards as unsatisfactory the Munsterberg, the Faust-Piorkowski-Moede, and the Hamburg (Stern) tests for operators of motor vehicles and proceeds to devise a series of examinations of single traits ultimately embodied in a single, composite test which has many suggestive features. The final step in evaluating the test by comparison with satisfactory criteria remains to be carried through. An experimental analysis of performance on both the original Munsterberg test and on an adaptation of this, trenchant criticism of other tests, and detailed discussion of the tests tried out by the author, contribute additional interest to this carefully prepared article. The European tendency to treat the occupation of motorman and chauffeur as one, on the assumption that the same traits are required on both jobs, is well illustrated in Rupp's investigation.

A number of tests for use in the selection of operators of motor vehicles are described by Klemm (93). Of particular interest among these is a test of aptitude in steering motor vehicles embodying,

in a quite different instrument, principles developed at length by Rupp (141) in an article discussed above.

Twenty chauffeurs are the subjects of a study by Van Went (169) in which the results of tests of intelligence, time and accuracy of choice reaction, attention, reaction under the disturbing influence of electric shock, etc., give a high correlation with driving proficiency over a period of a year. The exact nature of the criteria cannot be determined from the article. A more extensive investigation limited to chauffeurs is reported by Wechsler (180), who uses a written test of mental alertness and a performance test in measuring the earning capacity and susceptibility to accidents of taxicab drivers. No complete description of the final sampling is given by the author, who finds significant relationships between the performance test scores and number of accidents. This oversight, and the failure to supply other necessary data, makes difficult an exact evaluation of the findings of this study. An interesting feature of the performance test, which otherwise resembles closely apparatus used in earlier American and German investigations on motormen and chauffeurs, is the attempt to measure carelessness by calling for the inhibition of response with reference to one of the foot pedals.

The desirability of requiring applicants for automobile driving licenses to pass suitable psychological tests is emphasized by Cattell (44) in a plea for the application of psychological methods in the promotion of highway safety.

The use of tests in the selection of railway employees is well established in Germany. A series of tests for engine drivers are described in an unsigned article (7) in which advances in this field are discussed.

(D) *Tests for Salesmen, Engineers, Executives, etc.* Tests of personality traits are used almost exclusively in an investigation by Freyd (67) on the selection of promotion salesmen. Eight out of a battery of twenty-one tests give satisfactory results in a study whose chief interest lies in the number and character of the tests employed. The findings suffer somewhat in effectiveness by reason of a vagueness of criteria, a small number of cases, and an arbitrariness in weighing individual test scores.

The difficulties in devising tests of aptitude for the professions, in which objective criteria are not readily available, are well illustrated in an elaborate investigation on standardized tests for elementary teachers (8) employing mainly tests of technical knowledge and

experience. The study is a model of scientific procedure in test development and of judiciousness in the interpretation of test data in the elaboration of conclusions. Suggested tests for probation officer (12) and figures on the general intelligence scores of nurses by Earle (56) represent the only other contributions in the way of tests for selecting workers in the professions and related occupations.

(E) *Miscellaneous Tests.* In addition to the experimental studies described above there are a few investigations on the selection of workers which do not fall readily into any of the groups listed above. There are also a number of studies not primarily concerned with the selection of workers which should nevertheless be brought to the attention of those interested in the applications of psychology in industry.

Among the former is a report by O'Rourke (122) of the development and try-out of an especially designed battery of tests for the selection of policemen.

Among studies having a bearing on the selection of workers, although not concerned with selection for specified occupations, is a description by Poppelreuter (128) of a clock designed to show the amount and regularity of work done on each test in the course of a psychological examination. The importance of work curves obtained in this manner in selection is stressed by the author. A test for the measurement of the personality traits of introversion and extroversion is described by Laird (101) in an article which, although lacking in experimental data, is valuable for the pithy summary of the nature of these traits and for the discussion of the industrial problems which grow out of their existence. Of interest, likewise, is a report on a measure of sociability by Gilliland and Burke (75), an inventory of recent developments in the rating and measurement of personality traits by Watson (178), a description of a new directions box by Lehmann (104), and an account of a recent English study on vocational guidance (2, 3) in which the significance of certain tests and of the personality judgments of trained examiners are discussed at length.

(F) *Trade Tests and Rating Scales.* The trade test as a measure of vocational fitness continues to receive scant attention. A trade test of skill in driving motor vehicles devised for use by the Civil Service Commission is described by O'Rourke (122). The test appears to have great possibilities both for use in examining applicants for driving licenses and in hiring skilled drivers. Trade knowl-

edge is largely measured in suggested tests for vegetable gardener (14) as well as in other batteries suggested for other uses by the *Bureau of Public Personnel Administration*. René-Jean (135) describes problems in dressmaking and design forming part of a comprehensive practical and written examination given to applicants for certificates of aptitude in dressmaking in Paris.

Titles on rating scales likewise appear infrequently during the period covered by this review. A critically analytical approach appears to be characteristic of the more recent publications on this topic. This is well illustrated in a series of articles by Kornhauser devoted to a statistical analysis of rating scale technique. The series is introduced by a thoughtful survey of the uses and limitations of rating scales (99). This is followed by reports of experimental studies on the reliability of average ratings (98) and on agreement among raters (97), embodying statistical data and judicious interpretation, which make this series an outstanding contribution to the literature on rating scales.

The use of rating scales in obtaining judgments on the effectiveness of sales clerks and as a basis for training salespeople is recommended by Cook and Manson (47) as the result of a careful statistical analysis of ratings on five traits by shoppers and by a selected group of customers. The dependence upon customers to make ratings, the employment of soundest statistical procedure in evaluating the rating scale, and the practical and conservative conclusions on the usefulness of the scale combine to make the article a significant addition to the literature on rating scales.

The relative merits of various types of rating scales and the advantages and limitations in the use of such scales are discussed for the layman by Freyd (66).

The adequacy of average ratings by untrained observers as a criterion is questioned by Earle (56) in a comparison of the personality traits and the intelligence of nurses.

(G) *Non-Test Factors in Selection.* The value of the application blank, photograph, etc., in selection and the fallacies of character analysis systems are succinctly summarized by Burtt (42) in his excellent volume on employment psychology. The validity of selection based upon a physiognomic examination is the subject of a number of other recent publications. Cleeton (46) briefly reviews the history of character analysis from the time of Aristotle and cites conclusions on the unreliability of external signs which follow from an examination of available experimental data. Evidence from a

number of experimental investigations is cited by Brandenburg (37) in an effective indictment of the Blackford system of character analysis. This article, together with a later discussion (38) of the factors tending to promote the survival of belief in such systems, make excellent material to be placed in the hands of believers. The methods of character analysis employed by the pseudo-psychologists whose advertisements occupy so much space in the newspapers and periodicals are described and critically discussed in articles by Leary (102) and Trabue (165).

An unusual and fertile approach to the study of the validity of appearance in the analysis of personality is described by Rice (137). The distorting influence of "stereotypes" or preconceptions on the supposed appearance of individuals in certain occupational groups and at certain social levels is illustrated in data gathered by the author. The importance of making behavior the sole criterion in analyzing character is again shown to be necessary in this unique contribution.

The reliability of handwriting as a measure of vocational aptitude for the occupations of ticket agent and locomotive engineer are investigated by Couvé (48). Observers untrained in graphology exhibit a reliability in predicting success from the examination of the handwriting equal to that of the exponents of a graphological system of character analysis. The analysis of this study and the failure of a graphologist to differentiate among locomotive engineers with and without accident records lead the author to conclude that the usefulness of graphology to scientific selection is somewhat limited. The article reflects, however, a rather receptive attitude toward graphology which also crops out in a number of other German publications.

The influence of physical and other nontest factors in sales success is studied by Snow (151), who contrasts his findings with those of other investigators in an article containing generalizations which in instances seem hardly to follow from the meager and inadequately analyzed data presented by the author.

Age as a factor in the promotion of university professors is studied by Kitson (92). A personnel study of psychologists by the same author (91), giving data on turnover in this profession, employs the historical technique of vocational analysis recommended by the latter for use in investigations in vocational selection and guidance. That women make more desirable office workers than men is the conclusion by Bergen (22) from a study of resignations and length of service of 400 workers over a period of three years.

Of interest as an indication of the possible contribution of other than testing methods to vocational selection are the conclusions of the English study on the reliability of estimates on temperament following from a clinical interview by trained observers (2).

(H) *Analysis of Occupational Qualifications.* The study of occupational qualifications receives little attention in the literature as a distinct item, although the technique of job analysis and findings from the application of this technique are discussed in many of the articles on tests reviewed above.

One of the major contributions in this field is a special report issued by the National Institute of Industrial Psychology on occupational analysis (119). The special characteristics and uses of this technique are discussed and examples given of its application in a laundry. Of special interest in this study is the method for analyzing and recording movements as a means of determining the type of manual skill demanded by each process.

The desirability of applying the technique of job analysis in the organization of prison industries is discussed by Doll (55).

Specialized studies include an analysis of the physical and mental factors underlying skill and speed in the operation of a loom by Fraser (65). Striking physical personality, power of ready speech, sympathy insight, etc., are among the qualities desirable in a leader according to the academic analysis of idealized leadership traits by Bernard (25). The article is a chapter from what is in many other ways an excellent volume on social psychology which has many points of interest to the worker in industry (24). The weakness in this analysis is the subjectiveness in method so largely characteristic of publications in this field. Three types of leaders, the "institutional," "dominant," and "persuasive," are recognized by Bartlett (20), who outlines the outstanding characteristics of each, and the condition under which each thrives. This article, as the one by Bernard (25), although interesting from many angles, shows the need for the application to leadership of the technique of job analysis as it has been applied in the printing industry and other occupations.

#### APPLICATION OF PSYCHOLOGY IN MERCHANTISING

No larger contributions on psychology in merchandising of any great importance appeared in this country during the last nine months of 1926. Brewster (39) weakens an otherwise helpful and readable introduction to retail advertising by a somewhat free use of psycho-

logical terminology. In German appears a third revised edition of König's (96) discussion of the psychological principles of importance in advertising, including a survey of new developments in this field in Germany and in the United States. There is also an improved second edition of the volume by Friedlander (69).

A few shorter general articles on psychology in advertising and a few reports on experimental studies are to be found in the literature. Schmied-Kowarzki (144) discusses the inadequacy of the definition of advertising given by other German authorities and arrives at a description of advertising as a means of arousing in others, by means of stimulation of attention, a favorable attitude and ultimately, in some cases at least, a response appropriate to the objective of the propaganda. This definition, combining aspects of consciousness and response, seems broad enough to cover all advertising situations regardless of the media employed and of the objective of the propaganda. It differs little, however, from Starch's statement on the aim of advertising which may be reduced to "attract attention, stimulate interest, secure response." Bartlett (19) devotes a short paper to a discussion of the second part of this aim—the arousal of interest—stressing the strength of "short circuits"; of appeals to the sentiments and emotions, the importance of ease, comfort, and of the appeal to wants in productive advertising. The analogies and conclusions on the relationship of instincts and wants and advertising interest are in the nature of loose generalizations unprovided with experimental supports.

Strong and Loveless (159) contend that the major objective of advertising is first to make a reader "want," and secondly to "form a solution" showing how the want may be satisfied. Experimental evidence is cited to show that the appeal to a reader's want is more effective in the recall of trade names than advertisements dwelling on solutions through repeated emphasis on the trade name. An experimental approach to this problem such as described in this article, regardless of the flaws the critical reader may discover, is in encouraging contrast to the rambling perorations so prevalent in the treatment of this topic.

Strong (158) contributes an experimental study from which he concludes that the effectiveness of an advertisement is forcibly increased by using white space up to 60 per cent of the area of the advertisement proper, and that 20 per cent additional area of white space around the advertisement gives the greatest increase in effectiveness, cost being considered.

Attention to advertisements is the subject of an investigation by Nixon (121), who reports on an ingeniously arranged and well controlled experiment, the setting of which is a shop window and the passing public the subjects. The number and duration of fixation of attention are accurately recorded for different types of advertisements presented under different conditions, including the use of decoys. There are findings of interest both from point of view of technique and of methods for the study of attention to advertisements, and in confirming the results of previous investigations on the attention value of color, pictures, etc.

A less objective approach is to be found in an experiment by Bartlett (21) for judging the "attracting power" (attention value) and "holding power" (arousal of interest) of advertisements by means of rating scales. The tendency for a distribution of advertisements to show a normal scatter and the results of a series of experiments in grading are made the basis for the construction of a number of rating scales similar, for example, to the Ayres handwriting scale, in which, however, standard advertisements are used as a basis of comparison in grading other advertisements. The approach has an element of interest, but the unreliability of individual judgments and other unfavorable comparisons are given too little weight in discussing the usefulness of this method. The historical method recommended by Kitson is applied by Warden, Yahn, Lewis and Eigenmann (177) in studying changes over a period of twenty years in size of advertisements and ratio of advertisements to reading space in a well-known weekly. The authors note changes in the increase in the use of full-page advertisements, of drawings, in the use of coupons, etc. Burchard and Warden (40) find that the percentage of recall of advertisements becomes significantly smaller as the size of the advertising section is increased.

Psychological aspects of radio advertising are discussed by Kienappel (90), who points out the need for experimental investigations on such factors as length and form of material to be used in this form of advertising, the optimum number of repetitions, and on kindred problems.

#### OTHER INDUSTRIAL APPLICATIONS

The writer has discussed in an earlier review of the literature on psychology in industry (171) the differences in outlook between American and European psychologists on the scope of the application of psychology in industry. That the European psychologist con-

tinues to preempt a major portion of the research field turned over to industrial engineers in this country is evidenced in the number of articles on motion study, on the effect of illumination, ventilation, and other conditions of work, on rest pauses, etc., appearing in the *Journal of the National Institute of Industrial Psychology*, *Psychotechnische Zeitschrift*, *Industrielle Psychotechnik*, and other periodicals either devoted to industrial psychology or publishing articles in this field, as for example, the reports of the *Industrial Fatigue Research Board of Great Britain*.

It is therefore not surprising to find that the major portion of the volume by Walther (176) on psychotechnology is given over to a discussion of motion study, improvements in conditions of work, etc., including considerable critical material on the work of Taylor and his followers. As a matter of fact, the most valuable section of this book is that devoted to an historical summary of what American psychologists would be apt to describe as industrial engineering. The description by Lipmann (106) of current investigations in industrial psychology in Germany and the report of the *International Conference on Psychology and Psychotechnique* (5) likewise reveal the broader range of activities of European psychologists. The annual reports of the *National Institute of Industrial Psychology* (15) show clearly the extent to which problems on conditions and methods of work occupy the attention of investigators associated with this organization. Myers (118), in an article on the Institute's work, outlines the position of the industrial psychologist, emphasizing the importance of his knowledge of mental functions and of his point of view, as contrasted with the mechanistic attitude of the "so-called efficiency engineer," in promoting both better adjustments and increased production in industry. This controversy between industrial psychologist and efficiency engineer finds reflection in a popular article by Fox (64) commanding the humanistic attitude of the former and attacking further the mechanistic attitude of the latter. The author finds in Myers' attitude a scientific confirmation of the common sense point of view on the speeding-up and mass production of the efficiency engineer. The article is of interest as an expression of an extreme point of view on the nature of industrial progress, as much as one may question, or at least demand experimental verification for the emphasis placed on monotony, ugly surroundings, the absence of media of self-expression, etc., as the roots of industrial troubles. The controversy is further touched upon in

articles by Maxwell (111) and Miles (116) on the use and abuse of time study.

As in the earlier review, and for reasons there stated, no attempt will be made to cover in the present summary studies of the types mentioned above. The reader interested in such studies is referred to the publications named above, and to the excellent summaries of these investigations appearing from time to time in the *Journal of Personnel Research* and in *Industrial Psychology*. There are, however, a number of contributions on the application of psychological principles and technique in analyzing the causes of accident and on accident prevention; to the analysis of motives in industrial training, etc., and similar topics of more general interest to psychologists in this country, which have been selected for review below.

The *industrial accident* as a psychological problem is considered in a number of recent American and foreign publications. Individual differences in liability to accidents are studied by Marbe (109) in the case of 3,000 military officers, school children, and street railway employees. That susceptibility to accident can in part be predicted from the number of accidents in which the individual has already been involved follows from this extensive statistical study. Differences in proneness to accidents are likewise demonstrated in very thorough statistical analysis of accidents to factory workers in thirteen plants by Newbold (120). The consistent presence of an individual tendency to accidents is shown not only by a correlation between accidents in two different periods, but also between accidents of one type and those of another and between accidents in the factory and at home. The investigation, from which follow conclusions on the relation of age, minor illnesses, experience, etc., to accidents, is a model of scientific thoroughness.

The statistical study of Newbold is supplemented by an inquiry by Farmer and Chambers (59) into the influence of individual differences in specialized mental abilities and temperamental traits on accident rates. A difference of 48 per cent in accident rate between those scoring above and those below the average on the tests and a detailed analysis of this difference lead to the conclusion that inequality in accident liability is determined not solely by chance, but by measurable differences in traits measured by the tests. The procedure and conclusions of this industrial study are characterized by the qualities which one expects in a laboratory experiment and which are often missing from industrial investigations. In this respect it is similar to other studies of the Industrial Fatigue Research Board.

The data gathered in the course of this study and of the inquiry by Newbold (120), as well as in earlier investigations by Greenwood and Woods (77), Osborne and Vernon (123), etc., represent an accumulation of material of outstanding value in the determination of the causes of accidents.

Additional evidence on differences in liability to accident is provided by Schmitt (143), whose figures on accidents to railway employees are cited by Marbe (109) in confirmation of his conclusions on accident susceptibility. Further data is furnished in a later article by Schmitt (142) which also gives interesting figures on the influence of the hour of work, the day of the week, and weather conditions on the incidence of accidents. Judgments on the causes of accidents to railway employees are obtained by Bloss (32), who likewise analyzes the influence of weather, hour of day, etc., as well as of failures in attention, memory, interest, etc. The latter agrees with other investigators in stressing the importance of the mental factors and in pointing out the need of analyzing and measuring the traits underlying differences in individual liability to accident as an aid to accident prevention. Additional figures on the influence of age, etc., on accident rate are given in a volume by Lipmann (105).

Stephenson (153) cites data from some of the investigations discussed above and others, including Wechsler's study of taxicab drivers (180) in a well organized discussion of the causes of industrial accidents. The conclusion is drawn that the problem of accident prevention is not primarily one of mechanical safeguards but that it is largely a psychological one. Chamberlin (45) briefly indicates the contribution of lapses of attention, of memory, of emotional disturbances, etc., to accidents in street railway operation.

Price (130) outlines a course in accident prevention recently organized at New York University. Although based on the assumption that human rather than mechanical failure is largely responsible for accidents, that no more than 10 per cent of accidents can be prevented by mechanical safeguards, this outline includes no provision for discussing prevention in the light of individual differences in proneness as revealed in the investigations such as those reviewed above.

The application of psychological principles in the *training* of workers continues to receive little attention. Possibilities in this direction are touched upon in a chapter by Walther (176). Procedure in the improvement of training in retail stores is described by Howard (85). Berling (23) describes the use of practice curves in spe-

cialized operations such as filing, tapping with hammers, making micrometer readings, etc., in training metal trade apprentices. Examples from the training of crane operators are also introduced in a thoughtful discussion of the usefulness of organized, scientific training for skilled workers. Apparatus for measuring improvement in the operations involved in the use of small hammers and the findings of an experimental study of practice in this work are described by Bolt (33).

The relative merits of the "whole" and "part" methods of learning in the factory are investigated by Finck (60), employing as subjects thirty-six apprentices. In spite of certain weaknesses in procedure, as for example in the small number of operations practiced by the subjects, the experiment is significant as one of the few involving a direct transfer of the research technique of the psychological laboratory to the factory for training purposes.

Principles for improving the efficiency of the individual worker—of the man in the shop as well as the executive—are clearly stated and amply illustrated in a treatise on how to study and work effectively by Book (35). The accumulation of scientific data on factors affecting learning, habit formation, and the maintenance of working efficiency, the clarity of presentation and organization, the practical illustrations, etc., make this volume a very valuable handbook for those interested in industrial training as well as for teachers and students in other fields.

Job analysis as a basis for the construction of curricula in the metal trades industry is discussed by Jones (88). Of additional interest to the psychologist interested in the training of industrial personnel is the treatise on the psychology of coaching by Griffith (78), a suggestive article on the use of tests in shop instruction by Toops (164), and a description by Unger (167) of the experiment on training subnormal girls in the dressmaking trade referred to elsewhere in this review. A volume by Payne (126) on teaching industrial subjects includes chapters on job analysis as an aid to training, grading systems, instruction methods, etc., as well as chapters on laws and conditions of learning.

The *motives* animating industrial workers are considered in a few recent publications. An unusually interesting contribution in this field is provided by Williams (181), who, hiring himself as a worker in factory and mine, applies the case study method in investigating the behavior of workers in industry. The volume has a definite value

in formulating on the basis of the observed reactions of workers a statement of motives underlying these reactions. It is written for the layman by one who is not primarily interested in psychological techniques. The method of approach, in its failure to isolate variables, to compare groups, to analyze available data, etc., is far from scientific. There is a failure to list important motives, and much remains to be done in the further analysis of the urges controlling the workers' reactions cited by the author. However, he has accumulated an array of data furnishing far greater justification for his conclusions on the nature of motives than the analogies and *obiter dicta* underlying the conclusions of many professional psychologists who have written on the rôle of instincts, the subconscious, etc., in determining the behavior of workers in industry. Of additional interest to the student of human behavior are the problems and references at the end of each chapter, and the pages of practical recommendations for promoting individual adjustment which close the book.

Typical of the subjective approach of a presumably more scientific worker in this field, the psychiatrist, is the summary (17) of a recent conference on the psychology of incentives in industry. The influence of such factors as scientific selection, organized training, the elimination of monotony, etc., on production is discussed by Hamburger (79) in an article stressing the danger of financial incentives which promote physical and mental strain.

Sinclair (150) passes in uncritical review methods to be employed in stimulating the interest of workers. Gardiner (72, 73, 74) writes popularly and with little critical analysis on such disturbing urges as anxiety, assorted aggravations, and other stumbling blocks to efficiency.

Closely related to the study of workers' motives is the analysis of factors determining the *maladjustment* of the individual worker in industry. During the past year there appears to have been an awakening of interest in the application of psychology in the study of such maladjustments and in the readjustment of the individual worker. There appears to be growing recognition of the fact that efficiency in production and the happiness of the individual worker is dependent not only upon selection, as completely organized along scientific lines as that may be, but at least equally as much upon the readjustment of the employed worker. This point of view, emphasizing the fact that vocational adjustment cannot always be completed in the selection process, finds expression in a number of articles

included in a symposium on industrial adjustment through vocational guidance edited by Fryer (70). It is discussed in an article by Viteles (173), who cites case studies of maladjusted taxicab drivers in illustration of the application of psychological tests and of the clinical method for this purpose. Lott (108) contributes to this symposium a discussion on the interest of the industrial personnel office in such readjustment and on its activities in guiding individual employees, likewise illustrated by case studies. The psychiatric approach in the analysis and treatment of employees of industrial plants is demonstrated in a summary of six case histories by Elkind (58). There are important differences in the approach of these three authors toward the problem of adjustment, but in the articles of all, as well as in others reviewed below, the need for an extension of the application of specialized techniques in the adjustment of the individual employee finds expression.

The importance of psychiatric work in industry, of psychiatric advice in individual problems, is stressed in a report of a symposium on psychiatry in industry (1) to which Anderson, Mayo, Scott and Stevens contribute. Scott limits herself to pointing out the contribution of psychiatry in the case of mental and nervous disorders among employees of an insurance company. Mayo sees in selection, welfare work, fatigue studies, etc., only the reflection of the psychiatric approach. Anderson and Stevens contribute their bit toward making clear the omnipotence of psychiatry and the omniscience of psychiatrists. The application of the principles of mental hygiene in the readjustment of women in industry is discussed in a readable and convincing article by Jarrett (87). The author follows Southard in recommending the organization of mental hygiene working parties composed of a psychiatrist, a psychiatric social worker and a psychologist for the study and treatment of "nervous" employees.

The methods for the study and classification of personality types used by industrial psychiatrists are critically discussed by Sherman (148) who, with much justification, finds cause for objecting to the individualistic character of these methods and to the almost sole dependence upon subjective methods of study. The desirability of considering the dreams of workers in analyzing the failure of a worker is discussed by Pruette (131) in an article pointing out the need for further industrial studies on dreams and the job.

Although appearing incidentally in other studies *fatigue* as a specific psychological problem appears in few recent publications.

Fatigue in industry is discussed by Martin (110) in an article giving a clear, concise summary of available knowledge on the nature, causes, and effects of fatigue. Reference is made to the influence of the shorter working day, of alternation in work, etc., in reducing the effects of fatigue. Experimental evidence on physical and chemical aspects of fatigue is summarized in an article on recent advances in the knowledge of muscular activity embodying material from a volume by Hill (84). Of interest both in connection with a study of fatigue and from the viewpoint of training is a critical summary by Knight (95) of experiments on the best methods for pulling and pushing heavy weights. In a report of an investigation by Legros and Weston (103) and in another by Miles and Angles (114), on the design of machinery in relation to the operator as well as in the volume by Klockenberg on typewriter construction and in an article by Lahy (100) is found material of value in the consideration of the industrial fatigue problem.

Significant also from the point of view of its aim and of technique is a study by Tillmann (162) giving a curve showing increments of fatigue in the various portions of a working day in the case of two types of foundry workers.

A number of additional articles, *miscellaneous* in so far as material is concerned, remain to be mentioned. Psychological foundations of business administration are considered by Follett (63) in a series of four papers, dealing with constructive conflict, the giving of orders, business as an integrative unit and power. These papers represent an application of the point of view and material of psychology in the formulation of an attitude toward these and other aspects of industrial activity. The point of view in its emphasis upon whole situations, upon integrations, upon the interactive nature of responses and desires, etc., resembles that of Gestalt psychology (although not so ear-marked) elaborated and brought to bear upon complex problems of human relations in industry. Examples are drawn from factory and office, occasionally from the laboratory and clinic, in illustration of the approach recommended by the author for the resolution of conflicts, the giving of orders, the distribution of power, etc., and for the further investigation of these and similar problems. The chief value of the papers lies in their thought provoking quality, their emphasis upon the scientific attitude, their detailed analysis of industrial problems and the suggestive if not always acceptable conclusions reached by the author. These conclusions are discussed by Dennison (51), who furnished further ex-

amples from his and other plants on the application of the principles of business administration formulated by Follett. The papers by Dennison (51) and Follett (63) appear in a volume on the scientific foundations of business administration, edited by Metcalf (113), containing also chapters on the application of the other sciences which merit careful reading by all interested in the application of scientific method to business administration. In addition to the papers reviewed herein, the psychologist will be especially interested in the chapters on biological foundations by Caldwell, and those on philosophical foundations by Overstreet.

The psychological factors underlying organization are analyzed by Miles (115) who stresses the importance of such factors as adequate job analysis, selection, training, leadership in promoting the efficiency of organization.

The importance of gaining the coöperation of workers in making time studies is stressed by Bangs (18) whose examples show the diversity of approaches which must be employed in winning the individual worker's coöperation. The article reveals the respect on the part of the industrial engineer for at least those mental attitudes on the part of the worker which affect the validity of data sought in time studies.

The influence of rhythm on production is investigated by Reinhardt (136) whose data on the effect of rhythm in light and heavy work, in simple and complex operations, etc., represents an interesting contribution in a field in which little work has been done.

Visual illusions are considered by Paul (125) in an article devoted to a discussion on the influence of color arrangements on office and factory efficiency. The effect of a variety of unsatisfactory conditions of work upon the attitudes and production of workers is discussed by Gardiner (71). Such factors are also considered by Fox (64), who finds in them the chief source of industrial trouble.

#### BIBLIOGRAPHICAL

A comprehensive bibliography is included with the review by Viteles (171) on psychology in industry to which the present review is a supplement. Many titles on tests, rating scales, job analysis, etc., are included in a bibliography of almost 700 references on employment psychology found in an appendix to the volume by Burtt (42). Bingham and Freyd (31) devote a section of their book to bibliography. Articles and books on industrial psychology are listed in an unannotated bibliography, by Rupp (140), on German contribu-

tions on psychology in industry during the years 1924 and 1925, and in an appendix to the volume by Walther (176). A comprehensive bibliography on the interview by Bradshaw (36) contains many titles of interest to the worker in the field of industrial psychology. This is likewise true of the bibliographical section in the volume on social psychology by Bernard (24).

## REFERENCES

1. ANDERSON, V. V., MAYO, ELTON, SCOTT, A., STEVENS, H. W. Psychiatry in Industry. *Month. Bull. Mass. Mental Hygiene Soc.*, 1926, 5, 1-6.
2. ANON. A Study in Vocational Guidance. *Indus. Fat. Res. Bd.*, Report No. 33, 1926, 106 pages.
3. ANON. A Study in Vocational Guidance. *J. Nat. Inst. Indus. Psych.*, 1926, 3, 124-138.
4. ANON. Industrielle Prüfstellen in Deutschland. *Ind. Psychot.*, 1926, 3, 446-453.
5. ANON. Mitteilungen der Internationalen Vereinigung für Psychologie und Psychotechnik. *Ind. Psychot.*, 1926, 3, 243-245.
6. ANON. P. R. T. Improves Selection and Training Methods for Employees. *Elec. Ry. J.*, 1926, 67, 971-976.
7. ANON. Selection Tests on the German Railways. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 201-204.
8. ANON. Standardized Tests for Elementary Teachers. *Pub. Pers. Studies*, 1926, 4, 279-298.
9. ANON. Suggested Tests for Automobile Mechanics. *Pub. Pers. Studies*, 1926, 4, 232 ff.
10. ANON. Suggested Tests for Carpenters. *Pub. Pers. Studies*, 1926, 4, 320 ff.
11. ANON. Suggested Tests for Electricians. *Pub. Pers. Studies*, 1926, 4, 106-116.
12. ANON. Suggested Tests for Probation Officer. *Pub. Pers. Studies*, 1926, 4, 185 ff.
13. ANON. Suggested Tests for Senior Account Clerk. *Pub. Pers. Studies*, 1926, 4, 166 ff.
14. ANON. Suggested Tests for Vegetable Gardener. *Pub. Pers. Studies*, 1926, 4, 338-342.
15. ANON. The Annual Meeting. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 63-85.
16. ANON. The Institute's Evidence Before the Committee on Education and Industry. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 95-98.
17. ANON. The Psychology of Incentives in Industry. *Human Factor*, 1926, 2, 9-11.
18. BANGS, J. R. Coöperation of Workers in Time Study. *Ind. Psych.*, 1926, 1, 455-460.
19. BARTLETT, R. J. The Emotional Appeal in Advertising. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 104-108.
20. BARTLETT, F. C. The Social Psychology of Leadership. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 188-193.

21. BARTLETT, R. J. The Judgment of the Value of Advertisements and the Construction of Rating Scales. *J. Nat. Inst. Ind. Psych.*, 1927, 3, 252-263.
22. BERGEN, H. B. Stability of Men and Women Office Workers. *J. Pers. Res.*, 1926, 5, 71-73.
23. BERLING, G. Planmässiges Einführung des Menschen in den Industriellen Arbeitsablauf. *Ind. Psychot.*, 1926, 3, 79-86.
24. BERNARD, L. L. *An Introduction to Social Psychology*. Holt, New York, 1926, 652 pages.
25. BERNARD, L. L. The Qualities of Leaders. *Ind. Psych.*, 1926, 1, 433-440.
26. BIEGELEISEN, B. Leistungssteigerung durch Facharbeiter Eignungsprüfungen in der Holzindustrie. *Ind. Psychot.*, 1926, 3, 238-242.
27. BIEGELEISEN, B. Psychotechnische Eignungsprüfung in einem Holzbearbeitungsbetrieb. *Ind. Psychot.*, 1926, 3, 118-120.
28. BILLS, M. A. Measuring Office Output. *Am. Mgt. Assoc. Office Executive's Series*, No. 16, 1926.
29. BINGHAM, W. V. Measures of Occupational Success. *Harvard Business Rev.*, October, 1926.
30. BINGHAM, W. V. Personality and Vocation. *Brit. J. Psych.*, 1926, 16, 354-362.
31. BINGHAM, W. V., and FREYD, MAX. *Procedures in Employment Psychology*. Shaw, 1926, 262 pages.
32. BLOSS. Zur Psychologie des Eisenbahnunfalles. *Ind. Psychot.*, 1926, 3, 353-363.
33. BOLT, R. Anlernverfahren für das Arbeiten Mit Kleinen Hämmern. *Ind. Psychot.*, 1926, 3, 193-211.
34. BOLTON, T. L. Emotional Endowments Build Success or Failure. *Ind. Psych.*, 1926, 1, 466-470.
35. BOOK, W. F. *Learning How to Study and Work Effectively*. N. Y., Ginn and Co., 1926, pages xviii + 475.
36. BRADSHAW, F. E. The Interview; A Bibliography. *J. Pers. Res.*, 1926, 5, 100-103.
37. BRANDENBURG, G. C. Do Physical Traits Betray Character? *Ind. Psych.*, 1926, 1, 580-588.
38. BRANDENBURG, G. C. Why Some Think They Can Read Character. *Ind. Psych.*, 1926, 1, 641-646.
39. BREWSTER, A. J. *Introduction to Retail Advertising*. A. W. Shaw Company, 1926, 319 pages.
40. BURCHARD, T. C., and WARDEN, C. J. The Effect of the Size of the Advertising Section upon the Value of Individual Advertisements in It. *J. Appl. Psych.*, 1926, 10, 162-171.
41. BURR, E. Adjustment of the Feeble-minded in Industry. *Proceedings of the 50th Session of the Am. Assoc. for the Study of the Feeble-minded at Toronto, Canada*, 1926, June.
42. BURTT, H. E. *Principles of Employment Psychology*. Boston, Houghton Mifflin Company, 1926, 568 pages.
43. BURTT, H. E. Principles of Employment Psychology. *Ind. Psych.*, 1926, 1, 635-640.

44. CATTELL, J. McK. Psychological Methods to Promote Highway Safety. *Scient. Monthly*, 1926, 12, 301-308.
45. CHAMBERLIN, E. M. Some Mental Causes of Accidents. *Ind. Psych.*, 1926, 1, 605-610.
46. CLETON, G. U. Estimating Human Character. *Scient. Monthly*, 1926, 12, 427-431.
47. COOK and MANSON. Abilities Necessary in Effective Retail Selling and a Method of Evaluating Them. *J. Pers. Res.*, 1926, 5, 74-82.
48. COUVÉ, R. Graphologische Berufseignungsuntersuchungen. *Ind. Psychot.*, 1926, 3, 114-117.
49. COWDERY, K. M. Measurement of Professional Attitudes: Differences Between Lawyers, Physicians, and Engineers. *J. Pers. Res.*, 1926, 5, 131-141.
50. CROCKETT, A. C. Testing Apprentices for the Burroughs Adding Machine Company. *J. Pers. Res.*, 1926, 5, 259-266.
51. DENNISON, H. S. Psychologist and Industrial Engineer, in METCALF, H. C., *Scientific Foundations of Business Administration*. Williams and Wilkins, 1926, pp. 279-294.
52. DEWHIRST, J. A. Personnel Selected and Trained in Milwaukee on Scientific Basis. *Elec. Ry. J.*, 1926, 67, 624-629.
53. DIETRICH, E., RUPP, H., MOEDE, W., and LANGENBERG, H. *Aufgaben und Grundlagen der psychologischen Arbeitseignungsprüfung*. Chemie, Leipzig, 1926.
54. DOBBINS, W. F. Clerical Test Scores and Schooling; An Insurance Company's Experience. *J. Pers. Res.*, 1926, 5, 83-96.
55. DOLL, E. A. Psychology in the Organization of Prison Industries. *Taylor Soc. Bull.*, 1926, 11, 3-7.
56. EARLE, M. G. The Relation Between Personality and Character Traits and Intelligence. *J. of Appl. Psych.*, 1926, 10, 453-461.
57. EBERLE, E. Eignungsprüfungen an Arbeiterinnen der Chemischen Industrie. *Psychot. Zeit.*, 1926, 1, 165-171.
58. ELKIND, H. B. Researches in Mental Hygiene in Industry. Psychiatric Case Studies in Department Store and Factory. *J. Ind. Hygiene*, 1926, 8, 94-102.
59. FARMER, E., and CHAMBERS, E. G. A Psychological Study of Individual Differences in Accident Rates. *Ind. Fat. Res. Bd.*, Report No. 38, London, 1926, 46 pages.
60. FINCK, E. Anlernung im Ganzverfahren und im Teilverfahren. *Ind. Psychot.*, 1926, 3, 212-216.
61. v. FOERSTER, J. F. Über den Charakter und seine Berufswichtigkeit. *Ind. Psychot.*, 3, 87-90.
62. v. FOERSTER, J. F. Der Charakter in der Eignungsprüfung. *Ind. Psychot.*, 1926, 3, 282-285.
63. FOLLETT, M. P. The Psychological Foundations of Business Administration, in METCALF, H. C., *Scientific Foundations of Business Administration*. Williams and Wilkins, 1926, pp. 114-171.
64. FOX, R. M. Psychology of Workshop. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 205-212.

65. FRASER, J. A. Skill and Speed in Cotton Weaving. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 162-165.
66. FREYD, M. An Appraisal of Relative Merits of Types of Rating Scales and Their Use. *American Mgt. Association, Annual Convention Series*, No. 38, 1926, 8 pages.
67. FREYD, M. Selection of Promotion Salesmen. *J. Pers. Res.*, 1926, 4, 142-156.
68. FREYD, M. What Is Applied Psychology. *Psych. Rev.*, 1926, 33, 308-314.
69. FRIEDLANDER, K. T. *Der Weg Zum Käufer*. Berlin, Julius Springer, 1926, 208 pages.
70. FRYER, D. (Editor). Industrial Adjustment Through Vocational Guidance. *Ind. Psych.*, 1926, 1, 739-748.
71. GARDINER, G. L. How Environment Moulds Workers. *Ind. Psych.*, 1926, 1, 364-368.
72. GARDINER, G. L. Industrial Anxiety. *Ind. Psych.*, 1926, 1, 471-477.
73. GARDINER, G. L. Overcoming Industrial Aggravations. *Ind. Psych.*, 1926, 1, 647-653.
74. GARDINER, G. L. Workers' Stumbling Blocks. *Ind. Psych.*, 1926, 1, 699-705.
75. GILLILAND, A. R., and BURKE, R. S. A Measurement of Sociability. *J. of Appl. Psych.*, 1926, 10, 315-327.
76. GLEASON, C. W. An Experiment in Testing Engine Lathe Aptitude. *J. of Appl. Psych.*, 1926, 10, 171-179.
77. GREENWOOD, M., and WOODS, H. M. The Incidence of Industrial Accidents. *Ind. Fat. Res. Bd.*, Report No. 4, London, 1919, 28 pages.
78. GRIFFITH, C. R. *The Psychology of Coaching*. New York, Charles Scribner, 1926, pages xii + 208.
79. HAMBURGER, R. Leistungssteigerung und Arbeiterschafft. *Ind. Psychot.*, 1926, 3, 178, 184.
80. HEYDT, C. Eignungsuntersuchungen für Eisenbahnbeamte der Assistentenlaufbahn und des Stellwerkdienstes. *Ind. Psychot.*, 1926, 3, 65-79.
81. HEYDT, C. Erfahrungen bei Erfolgskontrollen. *Ind. Psychot.*, 1926, 3, 367-372.
82. HILDEBRANDT, H. Beiträge zur Methodik und Praxis der psychotechnischen Eignungsprüfungen auf Grund von Untersuchungen bei der Firma A. Borsig. *Psychot. Zeit.*, 1926, 1, 187-194.
83. HILDEBRANDT, H., und BORSIG, A. Übung und Eignungsprüfung. *Ind. Psychot.*, 1926, 3, 96-109.
84. HILL, A. V. *Muscular Activity*. London, Baillière, Tindall and Cox, 1926, 115 pages.
85. HOWARD, R. E. Pittsburgh Stores Invest in Psychological Training. *Ind. Psych.*, 1926, 1, 461-465.
86. HUNN, A. Über die Gesetzmässigkeit der Beeinflussung von Exaktheitsarbeit durch das Tempo. *Psychot. Zeit.*, 1926, 1, 177-187.
87. JARRETT, M. C. Nervous Women in Industry. *Ind. Psych.*, 1926, 1, 271-277.
88. JONES, W. B. *Job Analyses and Curriculum Construction in the Metal Trades Industry*. N. Y., Columbia University, 1926, pp. 104.

89. KEELING, S. V. Recent Tests for Competence in Tram Driving. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 86-93.
90. KIENAPPOL, H. H. Entwicklung und Wesen der Rundfunkreklame in psychotechnischen Beleuchtung. *Ind. Psychot.*, 1926, 3, 314-316.
91. KITSON, H. D. A Preliminary Personnel Study of Psychologists. *Psych. Rev.*, 1926, 33, 315-323.
92. KITSON, H. D. Relation Between Age and Promotion of University Professors. *Sch. and Soc.*, 1926, 24, No. 613.
93. KLEMM, O. Beiträge zur Eignungsprüfung für den Lenkerberuf. *Psychot. Zeit.*, 1926, 1, 195-198.
94. KLOCKENBERG, E. A. *Rationalisierung der Schreibmaschine und ihrer Bedienung*. Berlin, Julius Springer, 1926, 201 pages.
95. KNIGHT, A. R. The Moving of Heavy Weights. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 99-103.
96. KÖNIG, T. *Reklame Psychologie. Ihr gegenwärtiger Stand*. München und Berlin, R. Oldenbourg, 1926, pp. 245.
97. KORNHAUSER, A. W. A Comparison of Raters. *J. Pers. Res.*, 1927, 5, 338-344.
98. KORNHAUSER, A. W. Reliability of Average Ratings. *J. Pers. Res.*, 1926, 5, 309-317.
99. KORNHAUSER, A. W. What Are Rating Scales Good For? *J. Pers. Res.*, 1926, 5, 189-193.
100. LAHY, J. M. French Psychologists Improve Typewriting. *Ind. Psych.*, 1926, 1, 333-337.
101. LAIRD, D. A. How Personalities Are Found in Industry. *Ind. Psych.*, 1926, 1, 654-662.
102. LEARY, D. B. Itinerant Psychologists. *Ind. Psych.*, 1926, 1, 395-397.
103. LEGROS, L. A., and WESTON, H. C. On the Design of Machinery in Relation to the Operator. *Ind. Fat. Res. Bd.*, Report No. 36, London, 1926, pp. 34.
104. LEHMANN, H. Eine neue Probe für Auftragserledigung. *Ind. Psychot.*, 1926, 3, 140-144.
105. LIPMANN, O. *Grundriss der Arbeitswissenschaft*. Gustav Fischer, 1926, 93 pages.
106. LIPMANN, O. Industrial Psychology in Germany. *J. Pers. Res.*, 1926, 5, 97-99.
107. LIPMANN, O., und STOLZENBERG, O. Methoden zur Auslese Hochwertiger Facharbeiter der Metallindustrie. *Schrift. z. Psy. Berufs.*, 1926, 11, 102.
108. LOTT, M. R. Guidance Aids Industrial Adjustments. *Ind. Psych.*, 1926, 1, 749-752.
109. MARBE, K. *Praktische Psychologie der Unfälle und Betriebsschäden*. München, R. Oldenbourg, 1926, 110 pages.
110. MARTIN, E. G. Fatigue and Rest. *Ind. Psych.*, 1926, 1, 345-353.
111. MAXWELL, J. M. S. The Use and Abuse of Time Study. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 138-344.
112. MAYER, T., und STERZINGER, O. *Die Berufseignung des Schusters*. Wien, Leipzig, Österreichischer Bundesverlag für Unterricht, Wissenschaft und Kunst., 1926, pp. 52.

113. METCALF, H. C. *Scientific Foundations of Business Administration.* Williams and Wilkins Company, 1926, 341 pages.
114. MILES, G. H., and ANGLES, A. Psychology and Machine Design. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 159-161.
115. MILES, G. H. Organization. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 181-187.
116. MILES, G. H. The Uses and Abuses of Time Study. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 145-146.
117. MOEDE, W. Germany Finds a Psychological Center Useful. *Ind. Psych.*, 1926, 1, 551-552.
118. MYERS, C. S. Human Relations Strengthened by Psychological Ideals. *Ind. Psych.*, 1926, 1, 341-344.
119. MYERS, C. S., and others. Occupational Analysis. *Nat. Inst. Ind. Psych.*, Report No. 1, London, 1926, 36 pages.
120. NEWBOLD, E. M. A Contribution to the Human Factor in the Causation of Accidents. *Ind. Fat. Res. Bd.*, Report No. 34, London, 1926, 74 pages.
121. NIXON, H. K. *An Investigation of Attention to Advertisements.* Columbia University Press, 1926, 36 pages.
122. O'ROURKE, L. J. Report of Director of Research; Forty-Third Report of the United States Civil Service Com., 1926, November, pp. XLVIII-LXXXVIII.
123. OSBORNE, E., VERNON, H. M., and MUSCIO, B. Two Contributions to the Study of Accident Causation. *Ind. Fat. Res. Bd.*, Report No. 19, London, 1922, 36 pages.
124. OVERSTREET, H. A. *Influencing Human Behavior.* N. Y. People's Inst. Pub. Co., 1926, 300 pages.
125. PAUL, M. R. Industrial Painting Helps Efficiency. *Ind. Psych.*, 1926, 1, 681-687.
126. PAYNE, A. F. *Methods of Teaching Industrial Subjects.* New York, McGraw-Hill Book Company, 1926, pp. xx + 293.
127. PFENNINGER, O. Eignungsprüfung von Anreissern. *Ind. Psychot.*, 1926, 3, 327-336.
128. POPPELREUTER, W. Die Arbeitskurve in der Eignungsprüfung. *Ind. Psychot.*, 1926, 3, 161-167.
129. POPPELREUTER, W. Tätigkeit und Ergebnisse des Forschungsstelle für industrielle Schwerarbeit, etc. *Psychot. Zeit.*, 1926, 1, 126-131.
130. PRICE, C. W. A University Tackles Accident Prevention. *Ind. Psych.*, 1926, 1, 688-691.
131. PRUETTE, L. Dreams and the Job. *Ind. Psych.*, 1926, 1, 490-492.
132. PRUETTE, L. Progress in France. *Ind. Psych.*, 1926, 1, 706-707.
133. PRUETTE, L. The Selection of Girl Cashiers. *Ind. Psych.*, 1926, 1, 277-279.
134. PRUETTE, L. (Editor). Women in Industry. *Ind. Psych.*, 1926, 1.
135. RENÉ-JEAN, S. Le certificat d'aptitude professionnelle pour la couture, la mode et la lingerie à Paris. *Le Formation Professionnelle*, 1926, 22, 56-61.
136. REINHARDT, H. Rhythmus und Arbeitsleistung. *Ind. Psychot.*, 1926, 3, 226-237.
137. RICE, S. A. "Stereotypes"; A Source of Error in Judging Human Character. *J. Pers. Res.*, 1926, 5, 267-276.

138. ROSSMANN, R. Aufbau und Wirken einer Eignungsprüfstelle in der Tuch-Grossindustrie. *Ind. Psychot.*, 1926, 3, 337-342.
139. RUNGE, W. Eignungsprüfung und Wettbewerbsleistungen von Schreibmaschinistinnen. *Ind. Psychot.*, 1926, 1, 129-140.
140. RUPP, H. Auswahl psychotechnischer Literatur in Deutschland aus den Jahren 1924-25. *Psychot. Zeit.*, 1926, 1, 131-134.
141. RUPP, H. Untersuchungen zur Fahrerprüfung bei der Deutschen Reichpost und bei den Städtischen Strassenbahnen der Gemeinde Wien. *Psychot. Zeit.*, 1926, 1, 157-164, 199-220.
142. SCHMITT, E. Unfallaffinität und Psychotechnik im Eisenbahndienst. *Ind. Psychot.*, 1926, 3, 363-366.
143. SCHMITT, E. Unfallaffinität und Psychotechnik im Eisenbahndienst. *Ind. Psychot.*, 1926, 3, 144-153.
144. SCHMIED-KOWARZKI, W. Das Wesen der Reklame. *Ind. Psychot.*, 1926, 3, 173-178.
145. SCHULHOF, A. Transportables Prüflaboratorium der Eisen und Metallindustrie, Teplitz, Tschechoslowakei. *Ind. Psychot.*, 1926, 3, 124-125.
146. SHELOW, S. M. Intelligence Tests for Stenographers. *J. of Pers. Res.*, 1926, 5, 306.
147. SHELOW, S. M. Selection of Motormen: Further Data on Value of Tests in Milwaukee. *J. of Pers. Res.*, 1926, 5, 183-188.
148. SHERMAN, M. Industrial Psychiatry. *Arch. Neurol. and Psychiat.*, 1926, 15, 524-527.
149. SHORT, O. C. Suggested Tests for General Machinist. *Pub. Pers. Studies*, 1926, 4, 211-223.
150. SINCLAIR, F. D. Creating Worker Interest. *Ind. Psych.*, 1926, 1, 478-485.
151. SNOW, A. J. Personal Factors in Sales Success. *Ind. Psych.*, 1926, 1, 354-361.
152. SPIELMAN, W. On Devising Analytic Tests for Vocational Selection (1). *J. Nat. Inst. Ind. Psych.*, 1926, 3, 147-153.
153. STEPHENSON, A. Accidents in Industry. *J. Nat. Inst. Ind. Psych.*, 1926, 3, 194-200.
154. STOTT, M. B. *Report on the Present Position of Vocational Guidance and Vocational Selection*. The Women's Employment Publishing Company, London, 1926.
155. STRELLER, J. Erfahrungen mit den Methoden von Lipmann-Stolzenberg. *Schrift. z. Psy. Berufs.*, 1926, 11, 80-102.
156. STRONG, E. K. An Interest Test for Personnel Managers. *J. Pers. Res.*, 1926, 5, 194-203.
157. STRONG, E. K. An Interest Analysis of Personnel Managers. *J. Pers. Res.*, 1926, 6, 235-242.
158. STRONG, E. K. Value of White Space in Advertising. *J. Appl. Psych.*, 1926, 10, 107-116.
159. STRONG, E. K., and LOVELESS, J. E. "Want" and "Solution" Advertisements. *J. Appl. Psych.*, 1926, 10, 346-366.
160. TEAD, O., and METCALF, H. C. *Personnel Administration*. McGraw-Hill Company, New York, 1926, — pages.

161. TELFORD, F. Psychology Applied in Public Personnel Work. *Ind. Psych.*, 1926, 1, 418-426.
162. TILLMANN, H. Eine Kurve für die Errechnung des Ermüdungszuschlages bei Handarbeiten. *Ind. Psychot.*, 1926, 3, 109-114.
163. TOLKKÜHN. *Die Planmässige Ausbildung des Gewerben Fabriklehrings in den Metall- und hollzverarbeitenden Industrien*. Verlag Fischer, June, 1926.
164. TOOPS, H. A. What Tests and Measurements in Shop Work Can Do for Shop Instructions. *13th Annual Schoolmen's Week Proceedings, U. of P.*, 1926, pp. 466-475.
165. TRABUE, M. R. A Demonstration of "Character Reading." *Ind. Psych.*, 1926, 1, 521-524.
166. UHRBROCK, R. S. Interest as an Indication of Ability. *J. Appl. Psych.*, 1926, 10, 487-501.
167. UNGER, E. W. Vocational Training for Subnormal Girls; An Experiment in the Garment Machine Operating Trade. *J. Pers. Res.*, 1926, 5, 243-255.
168. UYENO, Y. Japan Advances in Applying Psychology. *Ind. Psych.*, 1926, 1, 369-370.
169. VAN WENT, J. M. Die städtische psychotechnische Prüfstelle Amsterdam.
170. VITELES, M. S. International Congress of Psychology. *Ind. Psych.*, 1926, 1, 722-723.
171. VITELES, M. S. Psychology in Industry. *Psych. Bull.*, 1926, 23, 631-680.
172. VITELES, M. S. Standards of Accomplishment: Criterion of Vocational Selection. *J. Pers. Res.*, 1926, 4, 483-487.
173. VITELES, M. S. The Clinical Method in Industry. *Ind. Psych.*, 1926, 1, 753-758.
174. VITELES, M. S. Clinical Viewpoint in Vocational Selection. *J. Appl. Psych.*, 1925, 9.
175. WALThER, L. Industrial Guidance Progresses in Europe; The Status of Psychotechnology in Germany, Switzerland and France. *Ind. Psych.*, 1926, 1, 801-803.
176. WALThER, L. *La Technopsychologie du Travail Industriel*. Neuchatel Delachaux Niestle. S. A., 1926, 240 pages.
177. WARDEN, YAHN, LEWIS and EIGENMANN. A Study of Certain Aspects of Advertising in the Saturday Evening Post. *J. Appl. Psych.*, 1926, 10, 63-67.
178. WATSON, G. B. The Measurement of the Less Tangible Qualities. *Voc. Guid. Mag.*, 1926, 4, 281-289.
179. WEBER, C. O., and LESLIE, M. Clerical Test Agrees with Employer's Ratings. *Ind. Psych.*, 1926, 1, 708-711.
180. WECHSLER, D. Tests for Taxi Drivers. *J. Pers. Res.*, 1926, 5, 24-30.
181. WILLIAMS, W. *Mainsprings of Men*. New York, Scribner's, 1926, 313 pages.

## THE THYROID GLAND

BY JOHN G. ROCKWELL

*University of Minnesota*

*Methods of Investigating Endocrine Function.* In general the methods of investigating endocrine function group themselves into two orders, augmentation and diminution. In the attempts to study gland activity from the augmentative standpoint, we find the following methods used: (1) intravenous injection, (2) rectal injection, (3) intraperitoneal injection, (4) administration by mouth, (5) direct application to the tissue, (6) organ transplantation, (7) nerve stimulation, (8) maternal administration, (9) clinical studies of excessive hormone secretion; for the study of gland depression: (1) gland extirpation, (2) infarction, (3) ligation of blood vessels, (4) interstitial injury, (5) specific cytolysis, (6) clinical studies of the deficiency of the gland.

Most of these methods have been useful in the study of one or more of the glands. Each, however, has specific defects. Only by a combination of the results from the many different methods—and let us hope that some new and more fruitful method will yet come—can an understanding of this baffling field shape itself.

*Anatomy of the Thyroid Gland.* Since the purport of this review is to deal with the functions of the thyroid gland in so far as it has a pertinent relationship to psychology, little need be said of the anatomy. The gland consists of two reddish brown lobes, joined in most species by an isthmus, and lies on the ventral aspect of the trachea. Variations in its structure, such as the absence of the isthmus are met with, as are also variations in size, seemingly connected with altitude, climate, and other factors (31, 155, 182, 189, 190, 191, 198, 199). The striking fact about the thyroid is the uniformity of its presence in all vertebrates. Its blood supply is extraordinarily rich (46, 144, 185). As to its nerve supply, no complete agreement has yet been reached. For the most part it seems to be mainly sympathetic. Fibers from the superior and recurrent laryngeal nerves are supposed to enter the gland.

Embryologically, the thyroid develops early, but no considerable amount of colloid is present until after birth. Jackson (94, 95, 96) maintains the colloid "increases slowly but steadily in relative size during the prenatal period." According to this author its relative

size is greatest at birth and then decreases (84, 111, 129, 130, 184, 187).

Histologically, its structure is characterized by closed vesicles containing the colloid. These vesicles vary in shape and size and are lined by epithelial secreting cells. The follicles are surrounded by loose areolar connective tissue and the entire gland encapsulated with a well defined capsule (2, 3, 25, 26, 27, 28, 30, 32, 39, 49, 50, 97, 153, 157, 186, 196).

*Thyroid Malfunctioning.* Thyroid disturbances, clinically seen, assume in the main four forms. Two of these, myxedema and sporadic cretinism, seem to be definitely associated with a deficiency of the active agent of the gland. The etiology of the others, exophthalmic goiter—Graves' disease or Basedow's disease—and cretinic degeneration, is not so surely known. Möbius (145) noted the opposition of symptoms in cases of myxedema and exophthalmic goiter. He came to the conclusion that exophthalmic goiter is probably due to an oversecretion, since myxedema seems so definitely to be associated with a deficiency (31, 40, 41, 89, 98, 99, 100, 146, 155, 190). It was here that the *hypo* and *hyper* theory of gland function seems to have arisen, a theory that has invaded all groups, particularly the psychologists. There is much sustaining evidence in favor of this theory. There is, on the other hand, very definite evidence that suggests that the theory is not irrefutable by any means, as Carlson (23) and Janney (101, 102) have so ably shown. The evidence for and against the *hyper* theory will be touched upon in later discussion.

*Sporadic Cretinism.* The picture of sporadic cretinism is so well known that little need be said concerning it. The outstanding characteristics are a dwarfish, misshapen body, a changed metabolism, an almost complete lack of sex urge, and a profoundly influenced intelligence. If the onset is early, then idiocy may result. One of the most spectacular feats of modern medicine is thyroid feeding, which results in a great degree of improvement in such cases. Several inches in stature may be gained in a single year; mentality improves, as do the other conditions. In fact, if the treatment is started early enough, the individual approaches the normal. Falta (40) states: "The lack of thyroid may be either congenital (thyroaplasia or thyrohypoplasia) or the same changes that cause myxedema of adults may affect the thyroid in early life (spontaneous infantile myxedema)." Heredity seems to play an important rôle. Cretins seldom

reproduce, but the literature indicates that parents of cretins often show thyroid malfunctioning in some directions, *i.e.*, endemic goiter, mild myxedema, and exophthalmic goiter (31, 40, 98, 99, 100).

*Myxedema.* Similar causative factors apply to the form of thyroid deficiency known as myxedema (43). Heredity seems to be a factor. It is interesting to note that a greater incidence of both cretinism and myxedema is found among the lower classes. This suggests an environmental factor, if not causative in itself, then at least it seems to be an aggravating agent.

McCarrison (134) has advanced evidence that cretinism, sporadic as well as endemic (regional), and goiter are due to specific infection in an unsanitary environment. Work on fishes indicates somewhat the same thing. Alcohol and other toxic agents, such as lead poisoning, seem to contribute to such conditions. Of the other factors mentioned as predisposing agents, we find undernutrition observed both clinically and experimentally by Marine and MacCallum. Probably the rôle of iodine is important here. Severe emotional states have also been urged as aggravative agents in predisposed subjects.

Improvement with proper thyroid therapy does take place; in some cases the results are so gratifying as to seem almost magical (40, 82, 98, 134).

There is some suggestion that the experimental attempts with cretinism and myxedema do not entirely duplicate the condition found in humans. It is possible that thyroid deficiency exerts a more malign influence on the human nervous system than on the experimental animal. Some information is available on this subject now. With the human the mental deficiency present can be arrived at by the intelligence tests, but not so with the animal. We do not have a *Binet test* by which to measure an animal's intelligence. Intelligence tests, if they measure intelligence at all, merely do it by means of the individual's learning capacity. Since this is true, the method of animal learning, then, would seem applicable to the comparative study of the problem. Two extensive researches have been conducted with this method, and several more are in progress (115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 150).

*Cretinic Degeneration.* Janney (100) defines cretinic degeneration as "an endemic disease characterized by goiter, cretinism, deaf mutism, idiocy, and caused probably by toxines of bacterial origin usually introduced by impure water or contaminated soil." There seems to be a geography of goiter. It is found especially in the Alps

and Tyrol regions of Europe, in some valleys of India, in the Great Lakes' belt of the United States, and in Montana, Idaho, and eastern Washington. New regions become infected and old endemic regions may become free of the disease (100, 134).

Goiter, like myxedema and sporadic cretinism, is influenced by heredity. Manual occupation, bad environmental conditions, and toxic factors are aggravating elements. The water supply is very important in the etiology of goiter, for goiter diminishes with the betterment of the water supply. Iodine exerts a benign influence (10, 13, 35, 36, 37, 79, 110, 114, 135, 136, 137, 138, 142, 159, 161, 162, 177, 192). McCarrison (131, 132, 133, 134) has produced goiter in man and animal which seems to suggest that the origin is in a specific bacterial infection, mediated largely through the water supply and unhygienic conditions. He believes there is no real distinction between endemic and sporadic thyroid malfunctioning, and that one explanation applies to both. This is a point of great interest, for if it is true, we have here the case of a toxemia working slowly and insidiously toward the profound modification of tissues in general. This is of special interest to the psychologist since the result is the production of deaf mutism and the severe mental deficiency seen in some of these cases of cretinic degeneration (40, 99, 100, 134, 146).

*Exophthalmic Goiter, Graves' Disease, or Basedow's Disease.* This extremely baffling and dangerous disease is characterized by increased metabolism, tachycardia, tremor, exophthalmos, and goiter. The nervous symptoms are especially interesting because of the great similarity to manic depressive insanity. The disease is marked by a fine tremor and great restlessness, insomnia, and alterations in mental behavior. Falta (40) lists these as "abnormal irritability, unmotivated gaiety, hasty speech, rapid flow of thoughts, an indication of flight of ideas, rapid change of mood, terrifying dreams; the character alters, the patient becomes mistrustful, choleric, capricious, strikingly euphoric, or often very much depressed." A true psychosis may be present. It is possible that this is merely a psychopathic predisposition brought to the front by the thyroid disturbance. Change in metabolism may be very great. The basal often shows an increase of 30 to 100 per cent. There is loss in weight and an increase in body temperature. It is this disturbance in metabolism that makes a basal so valuable diagnostically in the detection of the disease.

The incidence of exophthalmic goiter is independent of racial and

climatic influences. Women are more subject to it than men. It appears with greater frequency between the ages of sixteen and forty. Heredity plays an important rôle as a causative factor. Stimulants are not thought to influence its production. Infections have been urged as a cause, but especially do we find severe emotional states mentioned as responsible agents. It seems to be true that when found in men it is apt to be present in persons whose work subjects them to considerable strain. The disease has been observed to follow severe fright or prolonged worry and strain, such as is met with in war. Whether the emotional element is responsible for the onset has not yet been proved. The usual patient does not come into the hands of the doctor until the disease has made some progress, and his own reports can hardly be taken as altogether valid evidence. Nevertheless, the suggestion is very frequently made (9, 11, 31, 34, 41, 89, 90, 109, 148).

For more detailed references on the rôle of the thyroid in the emotions, the reader is referred to the very excellent review of Rikimaru (152).

Tests of thyroid presence, some of which are applicable as tests of thyrotoxicosis, have been worked out, several of them very ingenious. Two only will be listed. Goetsch (47) has one based on the hypersensitivity of the sympathetic nervous system to epinephrin. This hypersensitivity manifests itself in an increased blood pressure. Reid Hunt (91) showed that mice when fed on thyroid substance were less susceptible to the lethal effect of acetonitrile ( $\text{CH}_3\text{CN}$ ). This, however, was done on a small series of animals and has been questioned (160).

Excess thyroid feeding to animals has never entirely duplicated the clinical picture observed in man, for instance, the exophthalmos. Cannon (18, 19, 20, 21, 83) by irritating the cervical sympathetic was able to get an exophthalmos in dogs. Wilson, by stimulation of the cervical sympathetic, obtained a histological picture in the gland similar to that seen in thyrotoxic goiter. He concludes that Graves' disease is an overstimulation of the thyroid through the sympathetic nervous system. Edmunds (38) thinks he got hyperthyroidism, but Cunningham (33), Carlson, Rooks, and McKie (22) are agreed that the results could be interpreted on the basis of a toxic condition from the feeding. Thyroid preparations are definitely toxic and the effects of this toxicity can give many of the symptoms of the so-called *hyper* condition—the increased metabolism, loss of weight, etc. Further-

more, Carlson (23, 24) states "Spontaneous endocrine *hyper* function is unknown in experimental animals." Janney (101, 102) offers a theory of dysfunction as a cause of Graves' disease. He thinks Graves' disease is a question of toxemia, the toxins being split products of the thyroid hormone. Since the injection of muscle extracts will give somewhat the same picture as that observed in overfeeding of thyroid and the so-called hyperthyroidism, Janney's theory seems plausible. In the face of this chaos one wonders a little at the unquestioning acceptance of the *hypersecretion theory*.

*The Thyroid and Growth.* The symptoms seen in the human cretin greatly resemble those observed in the experimentally produced animal cretin. Both have the misshapen, pot-bellied appearance, and both show great growth retardation. Space does not permit the citation of the numerous experimental attempts—several of them fairly successful—to produce cretinism (85, 88, 113). A few of these will be taken up. They are typical enough to indicate the results generally reported.

Vincent and Jolly, working on an extensive series of animals, found great interference with growth, but the other cretinoid symptoms were absent. Sutherland Simpson (48, 125, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174) in his work on lambs found that out of sixteen thyroidectomized lambs three became typicalcretins. These lambs were about two months of age at the time of the operation. He reports these experimental cretins as "small and stunted, with broad faces and rickety limbs. The wool was coarse but did not tend to fall out." Hammett has a very extensive series of studies on the effects of thyroidectomy and thyro-parathyroidectomy. He used the white rat (54-75).

Basinger (4) in 1916, working at the University of Chicago, carried on an elaborate piece of work using rabbits as his experimental animals. The rabbit is an especially convenient animal for thyroidectomy, for with it one does not meet the complicating factor of parathyroid tetany. This is due to the fact that the external parathyroids are laterally enough placed so that there is little danger of removing them in the operation. Basinger found typical cretinism in 86 cases of the 140 animals operated on. He operated when the animals were between two and three weeks old, taking particular care to remove all tissue. He selected for controls normals from the same litters and was careful to maintain uniform conditions of feeding. He reports that where cretinism did not ensue some tissue was

left behind. It is interesting to note that the proportion of successes varies with the litter, the range being from 25 to 90 per cent. Symptoms were noticeable two weeks after the operation, the hair became dry, was coarse, and came out easily. Retardation was greatest from the eighth to the twelfth week. By the end of the tenth week the cretin's weight was 750 grams as against 1,400 grams for the control. The bones were short, the muscles of the limbs weak, and the animals seemed to show a condition resembling rickets. The skin was dry, scaly, and finally eczematous. The typical *pot-belly* was present. The animals were sluggish and would remain immovable for hours. There was no indication present of myxedema, such as is seen in the human subject. Normal blood serum transfusion gave little evidence of improving the condition. The transfusion of the serum of thyroid-fed animals did ameliorate it, as did thyroid therapy. Discontinuing the thyroid feeding resulted in a relapse. Thecretins were more susceptible than normals to the toxic action of thyroid feeding.

Thyroid feeding and growth has given conflicting results (16, 17, 20, 86, 176, 181, 183, 194, 195). Schaefer (154) reports accelerated growth, especially in females. Fordyce (42), working on rats, reports emaciation. Hoskins (87), also using rats, finds neither sex affected in body weight by feeding. He thinks that where a depressing effect is present it is due to the toxic effect from overdosage. The above studies do not seem to distinguish between the effect of iodine and thyroid substance. Cameron and Carmichael (15), in carefully controlled experiments, find body weight in thyroid-fed animals smaller. The size of the dose seems to have little effect. Their results indicate that thyroid feeding inhibits growth in young white rats, and that iodine has little effect.

Swingle (178) has advanced evidence that there is a direct relationship between the long period of larval life in certain anurans and the slow rate of thyroid development. He reports that grafting of the thyroid of second year tadpoles accelerates the growth in the latter to the developmental stage of the tadpoles from which the glands were taken. Gudernatsch (51, 52, 53, 92, 156, 179, 180) noted that feeding of thyroid tissue hastens metamorphosis. This fact forms the basis of one of the main *biological* tests for thyroid presence. Lately, however, Swingle seems to have shown that iodine is equally effective, if not more so (44, 200).

The above findings and others indicate fair uniformity of results

UNIVERSITY OF MICHIGAN LIBRARIES

on thyroid extirpation. Experimental cretinism, if not analogous to human cretinism, closely approximates it. It can be produced easily if the proper precautions are taken. Operation must be done at a fairly early date. Part of the parathyroids must be spared, or the tetany controlled, and the operation must be complete. A few cells, if left behind, seem to be sufficient to prevent the growth retardation.

*The Thyroid and Metabolism.* Thyroid deficiency is characterized by low oxidative processes (1, 8, 80, 112, 146, 147, 149). This is true of the human myxedematous and cretinoid types as well as of the experimentally produced forms. Thyroid therapy changes the picture. Magnus-Levy (139) studied the effects of thyroid administration on the oxygen intake and carbon dioxide output. He found a noticeable increase, especially with myxedematous persons. Cramer (29) thinks that tryptophane is the mother substance of the thyroid hormone. Abelin found that amines derived from protein act on katabolism in the same way as thyroid administration.

The thyroid seems to exert influence on heat regulation (143, 202). It has been reported that the gland undergoes diminution during hibernation in the bat. If the extract is injected into the hibernating hedgehog, respiration becomes more rapid and the animal wakes up. The temperature is also raised. Thyroidectomy is followed by anemia (140), and Bianchi (5) maintains its bactericide power is diminished. Bone ossification is interfered with. In regard to the action of the thyroid on the nervous system, Walter (193) has reported an interesting result. According to him, thyroidectomy interferes with regeneration of peripheral nerves. The condition was improved when thyroid therapy was resorted to. But there is little need of multiplying references of this sort.

*The Thyroid and Sex.* One of the outstanding facts about experimental thyroid deficiency and thyroid deficiency in humans is the depression of the sexual urge. Experimental cretins, if they are true cretins, seldom reproduce. Rickey (150) reports that she was able to get thyroidectomized females to breed, but not males. McCarrison (134) maintains that the marriage relationship conduces to better health due to the interrelationship of the thyroid and sex glands. One questions whether this is entirely true, for marriage carries with it a more or less ordered existence, where outlet for sex activity is more easily obtained than in the unmarried state. This fact might account for the difference in poise, and incidentally in health, without attributing a specific function of this kind to the

thyroid. One finds purported antagonistic relationship between the ovaries and the thyroid, and the contention that ovarian removal results in thyroid hyperactivity. Gley (45) has suggested that the large number of exophthalmic goiter cases following the menopause may be explained on this basis. This would seem to create a distinction between the sexes. It is true that toxic goiter is more prevalent in women than in men, but certainly it is found in men with no mean degree of frequency (151, 175).

*The Thyroid and Learning.* Liddell (115-128) at Cornell, working in connection with Simpson on cretin lambs, has studied extensively the effect of thyroidectomy on learning. In this connection he has also studied the relation of activity to learning. He used a simple maze in which the cul-de-sac could be reversed. Reversal of the cul-de-sac seemed to bring out a clearer difference. "Herd instinct" was more effective as an incentive than food. On account of the difficulty of controlling incentive and the muscular weakness that thyroidectomy brings on, Liddell supplemented his maze work with a method of conditioned responses. Some reports of these studies are available. Rickey (150), using rats, carried on an extensive study with thyroid feeding, injection, and thyroid deficiency (removal of the gland). Feeding thyroid substance resulted in loss of skill and accuracy. Injection of thyroid substance gave similar results. Thyroid removal produced a loss of preoperative learning. "Normal males mated with thyroidectomized females produced offspring which were small, underweight, and had locomotor and vasomotor deficiencies." The learning of the first generation offspring improved with thyroid administration (158).

Space does not permit going into the biochemistry of the thyroid product. The thyroid gland is able to retain iodine. Kendall (103-108) has isolated a product, *thyroxin*, which is very potent. It produces a rapid metamorphosis of tadpoles and is effective in treating hypothyroid conditions. "It produces the general physiological and metabolic effects of thyroid tissue," according to Cameron (14). All of the iodine of the gland is not in the form of thyroxin. The form of that not present in thyroxin is unknown, except that it is in an organic form (6, 7, 12, 76, 77, 78, 81, 93, 124, 197).

*Summary.* In general, the experimental evidence seems to indicate that a certain minimal amount of thyroid secretion must be present if adequate body functioning is to be maintained. In the absence of this secretion, particularly in the young, nerve, muscle, and

gland are profoundly influenced. On the question of diminution or *hypoactivity*, there is good agreement of clinical and experimental data. This is not the case in the *augmentative* researches. Attempts at augmentation through feeding are not entirely convincing on account of the toxicity of the substance. This introduces a complicating factor. The hyperactivity condition has not been demonstrated experimentally to the point where it is beyond question. Consequently, the agreement of clinical and experimental researches on the causes of thyro-toxicosis is not so close. It is interesting to note here that nature seems to have solved many of her mechanical problems through the provision of excess tissue for times of crisis. That the thyroid is no exception is demonstrated by the fact that a great share can be removed and still there is enough left for normal functioning. This fact suggests that normal functioning of the gland varies through a considerable range, and when added to the other clinical and experimental data places a large question mark after the *hypersecretion theory*. The meager contrary evidence now available does not disprove the theory. It merely makes it possible for us to look upon it with a healthy skepticism.

#### BIBLIOGRAPHY

1. ABELIN, L., und SCHEINFINKEL, N. Gaswechsel und Metamorphose von Amphibienlarven nach Verfütterung von Schilddrüse oder von jodhaltigen Substanzen. (Quoted from Physiological Abstracts, August, 1923.)
2. ARON, M. Evolution de la thyroïde foetale chez les mammifères. Sa concordance avec l'évolution du pancreas endocrine. (Quoted from Physiological Abstracts, February, 1927.) *Compt. rend. Soc. de biol.*, 1926, **94**, 275.
3. ARON, A. Indications apportées par l'étude de l'évolution thyroïdienne chez les embryons des mammifères au point de vue? du fonctionnement normal et pathologique de la thyroïde adulte. (Quoted from Physiological Abstracts, February, 1927.) *Compt. rend. Soc. de biol.*, 1926, **94**, 278.
4. BASINGER, H. R. The Control of Experimental Cretinism. *Arch. Int. M.*, 1916, **17**, 260-267.
5. BIANCHI (41 Croti), quoted from Croti.
6. BODANSKY, A. The Blood Chemistry of Thyroidectomized Sheep. *Proc. of the Soc. for Exper. Biol. and Med.*, 1922, **19**, 430-431.
7. BODANSKY, A. Effect of Thyroxin upon the Blood-Sugar of Normal and Thyroidectomized Sheep. *Am. J. Physiol.*, 1924, **69**, 498-509.
8. BOOTHBY, W. M. The Clinical Value of Metabolic Studies of Thyroid Cases. *Boston Med. and Surg. J.*, 1916, **175**, 564-566.
9. BOOTHBY, W. M. Adenoma of the Thyroid with Hyperthyroidism. *Endocrin.*, 1921, **V**, 1.

10. BOOTHBY, W. M. The Use of Iodine in Exophthalmic Goiter. *Endocrin.*, 1924, **8**, 727-745.
11. BOOTHBY, W. M., and SANDIFORD, I. A Quantitative Estimate of the Catalytic Power of Adrenaline and Thyroxine as Calorigenic Agents and the Relative Rate of Their Reduction. *J. Biol. Chem.*, 1924, **59**, proc. XL.
12. BOOTHBY, W. M. Iodin in the Prevention and Treatment of Goiter. *J. Ind. Med. Assn.*, 1925, **18**, 528.
13. BURLAGE, S. R. The Characteristic Electrocardiogram of the Cretin Sheep. *Proc. Soc. Exp. Biology and Med.*, 1922, **19**, 425-427.
14. CAMERON, A. T. The Biochemistry of the Thyroid Gland. *Endocrinology and Metabolism*, Vol. I, 243-265.
15. CAMERON, A. T., and CARMICHAEL, J. The Comparative Effects of Thyroid and Iodine Feeding on Growth in White Rats and in Rabbits. *J. Biol. Chem.*, 1921, **46**, 35-52.
16. CAMERON, A. T., and CARMICHAEL, J. Effect of Thyroxin on the Growth in White Rats. *J. Physiol.*, 1921, **5**, 55.
17. CAMERON, A. T., and CARMICHAEL, J. Acceleration of Growth and Regression of Organ Hypertrophy in Young Rats After Cessation of Thyroid Feeding. Production of Tetany by Thyroid Feeding. *Trans. R. Soc. Can.*, 1922, **16**, 57-70.
18. CANNON, W. B., and FRITZ, R. Further Observations on Overactivity of the Cervical Sympathetic. *Am. J. Physiol.*, 1916, **40**, 126.
19. CANNON, W. B., and CATTELL, J. Studies on the Conditions of Overactivity in Endocrine Glands. I. Electrical Response as an Index of Glandular Action. *Am. J. Physiol.*, 1916, **41**, 39-57.
20. CANNON, W. B., and CATTELL, J. Studies on the Conditions of Overactivity in Endocrine Glands. II. Secretory Innervation of the Thyroid Gland. *Am. J. Physiol.*, 1916, **41**, 58-73.
21. CANNON, W. B., and CATTELL, J. Studies on the Conditions of Overactivity in Endocrine Glands. III. The Influence of Adrenal Secretion on the Thyroid. *Am. J. Physiol.*, 1916, **41**, 74-78.
22. CARLSON, A. J., ROOKS, J. R., and MCKIE, J. F. Attempts to Produce Experimental Hyperthyroidism in Mammals and Birds. *Am. J. Physiol.*, 1912, **30**, 129-159.
23. CARLSON, A. J. Hypofunction and Hyperfunction of the Ductless Glands. *J. A. M. A.*, 1922, 79.
24. CARLSON, A. J., HEKTOEN, L., and SCHULHOF, R. Attempts to Produce Experimental Increase in the Rate of Output of Thyroglobulin by the Thyroid Gland. *Am. J. Physiol.*, 1925, **71**, 548-552.
25. CAYLOR, H. D., and SCHLOTTHAUER, C. F. The Thyroid Gland of Swine. *Anat. Record*, 1927, **34**, 331-340.
26. CENI, C. Il cervello e la funzione tiroidea. (Quoted from Physiological Abstracts, 1921-22, 2245.) *Riv. sperim. di freniate*, 1921, **44**, 243-286.
27. CENI, C. Das Gehirn und die Schilddrüsenfunction. (Quoted from Physiological Abstracts, 1921-22, 1886.) *Arch. Entwickel. Mechan.*, 1921, **47**, 587-616.

28. CHANG, H. C. Relation of Tryptophane to Thyroid Activity in the White Rat. *Am. J. Physiol.*, 1925, **73**, 275-286.
29. CRAMER, W. Tryptophane, Thyroid Gland, and Tumour Growth. *J. Physiol.*, 1923, Vol. 57, No. LXIX.
30. CRAMER, W., and LUDFORD, R. T. On Cellular Activity and Cellular Structure as Studied in the Thyroid Gland. *J. Physiol.*, 1926, **61**, 398-408.
31. CROTTI, A. *Thyroid and Thymus*. Lea and Febiger, Philadelphia.
32. CRAWFORD, J. H., and HARTLEY, J. N. J. I. The Influence of the Autonomic Nervous System on the Function of the Thyroid Gland. II. The Histological Changes in the Thyroid Gland Following Lobectomy in the Rabbit. *J. Exp. Med.*, 1925, **42**, 179-192.
33. CUNNINGHAM, R. H. Experimental Hyperthyroidism. *J. Exp. Med.*, 1898, **3**, 147-243.
34. DAVIES, H. W., MEAKINS, J., and SANDS, J. The Influence of Circulatory Disturbances on the Gaseous Exchange of the Blood. V. The Blood Gases and the Circulation Rate in Hyperthyroidism. *Heart*, 1924, **11**, 299-307.
35. DECIO, C. Sul contenuto in iodio della tiroide durante la gravidanza. (Quoted from Physiological Abstracts, November, 1923.) *Riv. ital. di ginecol.*, 1922, **1**, 59-66.
36. DOCK, G. Diseases of the Thyroid Gland. *Modern Medicine*, 1915, Vol. IV; *Med. Dictionary*, 12th Edition, 1923.
37. DYKE, H. B. Distribution of Iodine Between Cells and Colloid in the Thyroid. III. The Effect of Stimulation of the Vago-Sympathetic Nerve on the Dog's Thyroid Gland. *Am. J. Physiol.*, 1921, **56**, 168-181.
38. EDMUND, W. Eye Affections Following Experimental Thyroidectomy. *Ophthalmoscope*, 1916, **14**, 300-302.
39. ENGEL, W. Zur Innervation der Schilddrüse. (Quoted from Physiological Abstract.) *Pflüger's Arch.*, 1926, 211, 433-439.
40. FALTA, W. *Endocrine Diseases*. Blakiston's Son and Co., Philadelphia, 1923.
41. FITZGERALD, R. R. A Comparative Study of the Effect of Two Different Preparations of Iodine upon the Pre-Operative Basal Metabolic Rate in Exophthalmic Goiter. *Can. Med. Assoc. J.*, 1926, **16**, 159-161.
42. FORDYCE, A. D. Changes in the Thyroid Gland under Thyroid Feeding. *Edinburgh M. J.*, 1912, **9**, 52-62.
43. GABASTON, J. Tiroides y Gestacion. (Quoted from Physiological Abstracts, April, 1925.) *Revista Sud Americana*, 1924, **7**, 630-631.
44. GIACOMINI, E. L'azione dello iodio sullo sviluppo e sulla metamorfosi delle larve degli anfibii. (Quoted from Physiological Abstracts, August, 1925.) *Bull. d. sc. med. di Bologna*, 1924, **2**, 362-365.
45. GLEY, E. *Endocrinology and Metabolism*, edited by L. Barker. D. Appleton Co., New York, 1922. Cited by Swale Vincent.
46. GLEY, E., and CHEYMOE, J. Presence de l'iode dans le sang veineux de la thyroïde. (Quoted from Physiological Abstracts, June, 1925.) *Compt. rend. Acad. de sc.*, 1924, **179**, 930-932.
47. GOETSCH, E. Newer Methods in the Diagnosis of Thyroid Disorders, Pathological and Clinical. *N. Y. State J. M.*, 1918, **18**, 259-267.

48. GOLDBERG, S. A., and SIMPSON, S. Certain Pathological Tissue and Changes in Thyroidectomized Sheep. *Proc. of the Soc. for Exp. Biol. and Med.*, 1924, 21, 567-568.
49. GOORMAGHTIGH, N. Phagocytosis in Toxic Goiter. *Endocrin.*, 1924, 8, 323-330.
50. GRAY, S. H., HAVEN, F. L., and LOEB, L. Effect of Potassium Iodide and Thyroid Extract on Thyroid Gland of Guinea Pigs. *Proc. Exp. Biol. and Med.*, 1927, 24, 503-505.
51. GUDERNATSCH, J. F. Feeding Experiments on Tadpoles (Thyroid). *Archiv. f. Ent.*, 1912, 135, 40.
52. GUDERNATSCH, J. F. Feeding Experiments on Tadpoles (Thyroid), II. *Amer. J. Anat.*, 1914, 15, 12.
53. GUDERNATSCH, J. F. Feeding Experiments on Rats (Thyroid). *Anat. Rec.*, 1915, 78.
54. HAMMETT, F. S. The Stability of the Nervous System as a Factor in the Resistance of the Albino Rat to the Loss of the Parathyroid Secretion. *Am. J. Physiol.*, 1921, 56, 196-204.
55. HAMMETT, F. S., and TOKUDA, K. *Am. J. Physiol.*, 1921, 56, 380-386-389.
56. HAMMETT, F. S. Thyroid Apparatus. VIII. On the Alleged Exogenous Source of the Poisons Giving Rise to the Tetania Parathyreopriva. *Am. J. Physiol.*, 1922, 63, 151-154.
57. HAMMETT, F. S. Studies on the Thyroid Apparatus. XV. The Growth of Heart, Lungs, Liver, Kidneys, Spleen, Submaxillary Glands, and Eyeballs in Male and Female Albino Rats. *Am. J. Anat.*, 1923, 32, 75-94.
58. HAMMETT, F. S. Studies of the Thyroid Gland. XIV. The Effects of Thyo-Parathyroidectomy and Parathyroidectomy at 100 Days of Age on the Growth of the Glands of Internal Secretion of Male and Female Albino Rats. *Am. J. Anat.*, 1923, 32, 53-74.
59. HAMMETT, F. S. Studies of the Thyroid Apparatus. XXI. The Water Content and Refractive Index of the Blood Serum of Albino Rats Thyroparathyroidectomized and Thyroidectomized at 75 Days of Age. *J. Metabolic Res.*, 1923, 4, 65-72.
60. HAMMETT, F. S. The Effects of Thyo-Parathyroidectomy on the Growth of Organs in Albino Rats. *Am. J. Anat.*, 1923, 32, 1.
61. HAMMETT, F. S. Studies of the Thyroid Apparatus. XVIII. The Differential Development of the Albino Rat from 100 to 150 Days of Age and the Influence of Thyroparathyroidectomy and Parathyroidectomy Thereon. *Am. J. Physiol.*, 1923, 67, 29-47.
62. HAMMETT, F. S. Studies of the Thyroid Apparatus. XIII. The Effects of Thyo-Parathyroidectomy and Parathyroidectomy at 100 Days of Age on the Growth of the Reproductive System of Male and Female Albino Rats. *Am. J. Anat.*, 1922, 32, 37-51.
63. HAMMETT, F. S. Studies of the Thyroid Apparatus. XIX. The Effects of the Loss of the Thyroid and Parathyroid Glands at 75 Days of Age on the Gross Growth of the Albino Rat. *Amer. J. Physiol.*, 1924, 68, 1-23.
64. HAMMETT, F. S. Studies of the Thyroid Apparatus. IX. The Effect of the Loss of the Thyroid and Parathyroid Glands at 100 Days of Age

- on the Growth in Body Length, Body Weight, and Tail Length of Male and Female Albino Rats. *Am. J. Physiol.*, 1923, **63**, 218-244.
65. HAMMETT, F. S. Studies of the Thyroid Apparatus. XXVIII. The Differential Development of the Albino Rat from 75 to 150 Days of Age, and the Influence of Thyo-Parathyroidectomy and Parathyroidectomy Thereon. *Amer. J. Physiol.*, 1924, **70**, 259-272.
66. HAMMETT, F. S. Studies of the Thyroid Apparatus. XVI. The Growth of the Humerus and the Femur of Male and Female Albino Rats Thyro-Parathyroidectomized and Parathyroidectomized When 100 Days of Age. *J. Exp. Zoöl.*, 1924, **39**, 465-504.
67. HAMMETT, F. S. The Effect of Thyroid and Parathyroid Deficiency on the Gross Chemical Composition of the Long Bones. *J. Biol. Chem.*, 1924, **59**, proc. XLI.
68. HAMMETT, F. S. Studies on the Thyroid Apparatus. XXV. The Growth of the Humerus and Femur of the Albino Rat After Thyo-Parathyroidectomy and Thyroidectomy at 75 Days of Age. *Am. J. Anat.*, 1925, **35**, 421-454.
69. HAMMETT, F. S. Studies of the Thyroid Apparatus. The Growth of the Glands of Internal Secretion After Thyo-Parathyroidectomy and Parathyroidectomy at 75 Days of Age. *Am. J. Anat.*, 1925, **35**, 133-152.
70. HAMMETT, F. S. Studies of the Thyroid Apparatus. XXXIII. The Rôle of the Thyroid Apparatus in the Growth of the Reproductive System. *Am. J. Physiol.*, 1926, **77**, 527-547.
71. HAMMETT, F. S. Studies of the Thyroid Apparatus. XXXVII. The Rôle of the Thyroid Apparatus in the Growth of the Thymus. *Endocrin.*, 1926, **10**, 370-384.
72. HAMMETT, F. S. Studies on the Thyroid Apparatus. XXXI. The Rôle of the Thyroid and Parathyroid Glands in the Growth of the Central Nervous System. XXXII. The Rôle of the Thyroid Apparatus in the Solids, Water, Differentiation in the Central Nervous System During Growth. *J. Comp. Neurol.*, 1926, **171-204**, 205-222.
73. HAMMETT, F. S. Studies of the Thyroid Apparatus. XXX. The Relation Between Age at Initiation of and Response of Growth to Thyroid and Parathyroid Deficiency. *Endocrin.*, 1926, **10**, 29-42.
74. HAMMETT, F. S. The Pancreas and the Thyroid Apparatus. *Am. J. Physiol.*, 1926, **76**, 194.
75. HAMMETT, F. S. Studies of the Thyroid Apparatus. XXIX. The Rôle of the Thyroid Apparatus in Growth. *Am. J. Physiol.*, 1926, **76**, 69-91.
76. HARRINGTON, C. R., and BARGER, G. Chemistry of Thyroxine. III. Constitution and Synthesis of Thyroxine, with a Note on Physiological Test of Synthetic Thyroxine by D. Murray Lyon. *Biochem. J.*, 1927, **21**, 169-183.
77. HARRINGTON, C. R. Syntheses of 3, 4, 5-Tri-iodophenyl-pyrrolidione Carboxyl Acid, a Possible Isomer of Thyroxin. *J. Biol. Chem.*, 1925, **64**, 29-39.
78. HARRINGTON, C. R. Chemistry of Thyroxine. I. Isolation of Thyroxine from the Thyroid Gland. II. Constitution and Synthesis of Desiodo-Thyroxine. *Biochem. J.*, 1926, **20**, 293-299, 300-313.

79. HATHAWAY, J. C. The Inverse Relation of Iodine and Goiter in Utah. *Proc. Soc. Exper. Biol. and Med.*, 1924, **22**, 183.
80. HEATH, C. W., BAUER, W., and AUN, J. C. The Effect of Thyroid on Calcium Metabolism. *Proc. Soc. Exper. Biol. and Med.*, 1926, **23**, 699-700.
81. HEKTOEN, L., and SCHULHOF, K. The Precipitation Reaction of Thyroglobulin. *J. Am. Med. Assoc.*, 1923, **80**, 386-387.
82. HERMANN, H., et ABEL, E. Effet du traitement thyroïdien sur le métabolisme basal dans deux cas de myxoœdème congénital typique. (Quoted from Physiological Abstracts, April, 1923.) *Compt. rend. soc. biol.*, 1923, **88**, 93-95.
83. HICKS, C. S. On the Innervation and Secretory Path of the Thyroid Gland. *J. Physiol.*, 1926, **62**, 198-202.
84. HOGBEN, L. T., and CREW, F. A. E. Studies on Internal Secretion. II. Endocrine Activity in Foetal and Embryonic Life. *Brit. J. Exper. Biol.*, 1924, **1**, 1-13.
85. HOSKINS, E. R., and HOSKINS, M. M. Growth and Development of Amphibia as Affected by Thyroidectomy. *J. Exper. Zoöl.*, 1919, **29**, 1.
86. HOSKINS, R. G. Some Principles of Endocrinology Applicable to Organotherapy. *J. Am. Med. Assoc.*, 1922, 79.
87. HOSKINS, E. R. The Growth of the Body and Organs of the Albino Rat as Affected by the Feeding of Various Ductless Glands, Thyroid, Thymus, Hypophysis, and Pineal. *J. Exper. Zoöl.*, **21**, 295.
88. HOSKINS, R. G. Congenital Thyroidism (Guinea Pigs). *Am. J. Physiol.*, **26**, 311.
89. HOWARD, C. P. Clinical Syndromes Due to Thyroid Disease: Dysthyroidism. *Endocrinology and Metabolism*, L. Barker, Ed., Appleton & Co., N. Y., 1922.
90. HOWARD, C. P. Clinical Syndromes Due to Thyroid Disease: Hyperthyroidism. *Endocrinology and Metabolism*, L. Barker, Ed., Appleton & Co., N. Y., 1922.
91. HUNT, R. The Acetonitrile Test for Thyroid and of Some Alterations of Metabolism. *Am. J. Physiol.*, 1923, **63**, 257-299.
92. HUXLEY, J. S. Studies on Amphibian Metamorphosis. *Proc. Roy. Soc. (B)*, 1925, **98B**, 113-146.
93. INGVALDSEN, T., and CAMERON, A. T. Some Notes on the Iodine Compounds of the Thyroid. *Trans. Roy. Soc. Can.*, 1926, **20**, 297, 306.
94. JACKSON, C. M. On the Prenatal Growth of the Human Body and the Relative Growth of the Various Organs and Parts. *Am. J. Anat.*, 1909, **9**, 119-165.
95. JACKSON, C. M. Postnatal Growth and Variability of the Body and of the Various Organs in the Albino Rat. *Am. J. Anat.*, 1913-14, **15**.
96. JACKSON, C. M. Effects of Inanition upon the Structure of the Thyroid and Parathyroid Glands of the White Rat. *Am. J. Anat.*, 1916, **19**, 305-352.
97. JAFFE, R. H. Histological and Microchemical Studies on the Lipin Content of the Human Thyroid. *Proc. Soc. Exper. Biol. and Med.*, 1927, **24**, 348-349.

98. JANNEY, N. W., and HENDERSON, H. E. Concerning the Diagnosis and Treatment of Hypothyroidism. *Arch. Int. Med.*, 1920, **26**, 297.
99. JANNEY, N. W. Sporadic Hypothyroidism. *Endocrinology and Metabolism*, L. Barker, Ed., Appleton & Co., N. Y., 1922.
100. JANNEY, N. W. Cretinic Degeneration. *Endocrinology and Metabolism*, L. Barker, Ed., Appleton & Co., N. Y., 1922.
101. JANNEY, N. W. Concerning the Pathogenesis of Thyrotoxicosis. *Endocrin.*, 1922, **6**, 633-651.
102. JANNEY, N. W., and ISAACSON, V. I. (1) Blood Sugar in Thyroid and Other Endocrine Diseases. (2) Influence of Thyroidectomy and Thyroid Diseases on Protein Metabolites. (3) Thyroid Therapy. *Arch. Int. Med.*, 1918, **22**, 160-170.
103. KENDALL, E. C. A Method of Decomposition of the Proteins of the Thyroid with a Description of Certain Constituents. *J. Biol. Chem.*, 1915, **20**, 501-509.
104. KENDALL, E. C. The Isolation in Crystalline Form of the Compound Containing Iodine Which Occurs in the Thyroid; Its Chemical Nature and Physiological Activity. *Tr. Assoc. Am. Phys.*, 1915, **30**, 420-449.
105. KENDALL, E. C., and OSTERBERG, A. E. The Chemical Identification of Thyroxin. *J. Biol. Chem.*, 1919, **11**, 265-334.
106. KENDALL, E. C. Chemistry of the Thyroid Secretion. *The Harvey Lectures*, 1919-1920, J. B. Lippincott Co.
107. KENDALL, E. C. The Chemical Reactions Involved in the Physiological Functioning of Thyroxin. *J. Biol. Chem.*, 1924, **59**, proc., XXIX.
108. KENDALL, E. C. A Quantitative Study of the Physiological Action of Thyroxin. *Proc. Soc. Exp. Biol. and Med.*, 1925, **22**, 307-308.
109. KESSEL, L., LIEB, C. C., HYMAN, H. T. Exophthalmic Goiter. *J. Am. Med. Assoc.*, 1922, **79**, 213-216.
110. KIMBALL, O. P. The Prevention of Simple Goiter in Man. *Am. J. of Med. Sci.*, 1922, **163**, 634.
111. KULL, H. A. The Late Embryonic Development of the Thyroid Gland of the Albino Rat. *Anat. Rec.*, 1926, **32**, 133-142.
112. KUNDE, M. M. The Effects of Thyroid Feeding and Thyroxin Injection on the Basal Metabolic Rate, Temperature, and Body Weight. *Amer. J. Physiol.*, 1924, **6**, 635-645.
113. KUNDE, M. M. Blood Changes and Experimental Cretinism, Hyperthyroidism, and Myxedema. *Am. J. Physiol.*, 1926, **76**, 225.
114. LANG, K. Die Ergebnisse einer einjährigen Kropfbehandlung in den Pforzheim Schulen. (Quoted from Physiological Abstracts.) *Klin. Wchnsch.*, 1926, **5**, 182-185.
115. LIDDELL, H. S., and SIMPSON, S. Effects of Thyroxin, Thyroid Extract, and Sodium Iodide, Respectively, on Neuro-Muscular Activity in Cretin Sheep. *Proc. Soc. for Exp. Biol. and Med.*, 1922, **20**, 197-198.
116. LIDDELL, H. S. The Effect of Thyroidectomy on the Intelligence of Sheep. *Proc. of the Soc. for Exp. Biol. and Med.*, 1922, **19**, 423-425.
117. LIDDELL, H. S. Methods of Estimating the Activity and Intelligence of Normal and Thyroidectomized Sheep. *Proc. of Soc. for Exp. Biol. and Med.*, 1922, **19**, 343-344.

118. LIDDELL, H. S. The Possible Influence of Fatigue on the Reaction Time of Thyroidectomized Sheep. *Proc. of Soc. for Exp. Biol. and Med.*, 1923, **21**, 126-127.
119. LIDDELL, H. S. The Relation Between Spontaneous Activity and the Ability to Learn a Simple Maze. *Proc. of Soc. for Exp. Biol. and Med.*, 1923, **21**, 125-126.
120. LIDDELL, H. S. Higher Nervous Activity in the Thyroidectomized Sheep and the Effect of Thyroxin Thereon. *Am. J. Physiol.*, 1925, **72**, No. 1.
121. LIDDELL, H. S. The Behavior of Sheep and Goats in Learning a Simple Maze. *Am. J. Psychol.*, 1925, **36**, 544-552.
122. LIDDELL, H. S. The Relation Between Maze Learning and Spontaneous Activity in Sheep. *J. of Comp. Psychol.*, Dec., 1925, 5.
123. LIDDELL, H. S., and SIMPSON, S. The Effect of Thyroid Therapy on the Neuro-Muscular Activity of Cretin Sheep. *Am. J. Physiol.*, 1925, **72**, 63-68.
124. LIDDELL, H. S., and SIMPSON, E. D. Heat Regulation in the Thyroidectomized Sheep and Goat. *Am. J. Physiol.*, 1925, **72**, 56-62.
125. LIDDELL, H. S., and SIMPSON, E. D. The Onset of the Pot-Belly in the Thyroidectomized Sheep and Goat. *Am. J. Physiol.*, 1926, **75**, 195-196.
126. LIDDELL, H. S., and SIMPSON, E. D. A Preliminary Study of the Conditioned Motor Reflexes in Thyroidectomized Sheep. *Proc. Soc. Exp. Biol. and Med.*, 1926, **23**, 720-722.
127. LIDDELL, H. S. The Effect of Thyroidectomy on Some Unconditioned Responses of the Sheep and Goat. *Am. J. of Physiol.*, 1926, **75**.
128. LIDDELL, H. S. Some Methods for Investigating the Effect of Thyroidectomy on the Neuro-Muscular Mechanism of Sheep. *Quar. J. Exper. Physiol.*, 13, No. 2.
129. LIVINI, F. Gli organi a secrezione interna nel periodo embrionale e fetale ne' uomo I. Ghiandola tiroide. (Quoted from Physiological Abstracts.) *Arch. ital. di anat. e di embriol.*, 1922, **18**, 522-547.
130. LUCIEN, M. *Traité d'endocrinologie. La thyroïde*. Chez Gaston Doin, Editeur à Paris, 1925.
131. McCARRISON, R. The Etiology of Endemic Goiter. *Lancet*, 1913, 147.
132. McCARRISON, R. The Etiology of Endemic Goiter. *Lancet*, 1913, 219.
133. McCARRISON, R. The Etiology of Endemic Goiter. *Lancet*, 1913, 365.
134. McCARRISON, R. *The Thyroid Gland*. Wm. Wood & Co., N. Y., 1917.
135. MCCLENDON, J. F. World's Supply of Iodine in Relation to Goiter. *Science*, 1922, **56**, 269.
136. MCCLENDON, J. F., and WILLIAMS, A. Experimental Goiter and Iodine in Natural Waters in Relation to Distribution of Goiter. *Proc. Soc. Exp. Biol. and Med.*, 1923, **20**, 286.
137. MCCLENDON, J. F. Iodine and Goiter in Utah and Use of the Cottrell Precipitator in Iodine Analysis. *Proc. Soc. Exp. Biol. and Med.*, 1926, **23**, 494-496.
138. MCCLENDON, J. F. Iodine in Natural Waters in Relation to Goiter. *J. Biol. Chem.*, 1923, **55**, Proc. XVI.
139. MAGNUS-LEVY. Ueber den Respirationsischen Gaswechsel unter den Einfluss der Thyreodea. *Berl. Klin. Wochenschr.*, 1895, No. 30, 650.
140. MANSFIELD, G., and ORBAN, V. Über die Beziehungen von Schilddrüse und Milz zur Blutbildung. *Arch. Exp. Path. Phar.*, 1923, **97**, 285-305.

141. MARINE, D. Functions of Thyroid Gland. *Physiol. Rev.*, 1922, **11**, 326.
142. MARINE, D. Prevention of Goiter. *Public Health, Mich. St. Bd. of Health*, 1923, **11**, 23-24.
143. MARINE, D., DEUTCH, M., and CIPRA, A. The Effect of Large Doses of Iodine on Heat Production in Rabbits. *Proc. Soc. Exp. Biol. and Med.*, 1927, **24**, 657-662.
144. MASTIN, E. V. The Blood Supply of the Thyroid Gland and Its Surgical Significance. *Surg., Gynec. and Obst.*, 1923, **35**, 69.
145. MÖBIUS, P. J. *Die Basedow'sche Krankheit*. Alfred Holder, Wien, 1906.
146. PATON, D. N. *Regulators of Metabolism*. Macmillan and Co., London, 1913.
147. PAVLOVSKII, E. U. Hyperthyroidism and Regeneration. *Arch. Mikr. Anat., Entwickl.*, 1923, **99**, 620-627.
148. PLUMMER, H. S., and BOOTHBY, W. M. The Cost of Work in Exophthalmic Goiter. *Am. J. Physiol.*, 1923, **63**, 496.
149. RICHARDSON, H. B., LEVINE, S. Z., and DUBoIS, E. F. Clinical Calorimetry. XLI. The Storage of Glycogen in Exophthalmic Goiter. *J. Biol. Chem.*, 1926, **67**, 737-751.
150. RICKY, E. The Thyroid Influences on the Behavior of the White Rat. *Comp. Psy. Mon.*, II, 1923-25.
151. RIDDLER, O., and FISHER, W. S. Seasonal Variation of Thyroid Size in Pigeons. *Am. J. Physiol.*, 1925, **72**, 464-487.
152. RIKIMARU, J. Emotion and Endocrine Activities. *Psych. Bull.*, 1925, **22**.
153. RUSH, H. P., and JONES, L. T. Thyroid Studies. II. Changes in the Thyroid Gland Produced by Faecal Extracts. *Amer. J. Physiol.*, 1924, **70**, 18.
154. SCHAEFER, E. A. The Effects upon Growth and Metabolism of the Addition of Small Amounts of Ovarian Tissue, Pituitary, and Thyroid to the Normal Dietary of White Rats. *Quar. J. Exp. Physiol.*, 1912, **5**, 203-228.
155. SCHAEFER, E. A. *The Endocrine Organs*. Longmans, Green, Co., London, 1916.
156. SCHARPEY-SCHAEFER, E. Does the Blood of Patients with Exophthalmic Goiter Contain Active Derivatives of the Thyroid? *Quar. J. Exp. Physiol.*, 1923, **13**, 130-137.
157. SCHILF, E., and HEINRICH, K. A. Das histologische Verhalten der Schilddrüse nach einseitige Halssympatheticus Extirpation. (Quoted from *Physiological Abstracts*.) *Deutsch. med. Woch.*, 1924, **50**, 17-56.
158. SCHLESINGER, E. Hyperplasie und Hypersecretion der Schilddrüse bei Kindern und Jünglichen. (Quoted from *Physiological Abstracts*.) *Zeit. der Kinderheilk.*, 1920, **27**, 207-230.
159. SCOTT, W. C. M. The Relation of the Iodine Content and the Histological Structure to the Growth Curve of the Barn-Door Skate (*Raja Levis*). *Tran. Roy. Soc. Can.*, 1926, **20**, 229-237.
160. STRAUB, W. Wertbestimmung von Schilddrüsen Präparaten. *Deutsch. med. Woch.*, 1924, **51**, 1-4.
161. SHERMAN, H. C., and others. Iodine in Nutrition. Goiter as a Nutritional Problem. *Am. J. Pub. Health*, 1924, **14**, 1038-1042.

162. SILBERSCHMIDT, W. The Campaign Against Goiter Among Young Girls Above School Age by Means of Iodine Tablets. *Schweiz. Med. Woch.*, July 5, 1923; *Bull. mens offic internat. d'hyg. publique*, 1923, 15, 1376.
163. SIMPSON, S. Age as a Factor in the Effects Which Follow Thyroidectomy and Thyro-Parathyroidectomy in the Sheep. *Quar. J. Exp. Physiol.*, 1913, 6, 119-145.
164. SIMPSON, S. Some Effects of Thyroidectomy in the Sheep. *Proc. of the XIth International Physiological Congress*, held in Edinburgh, July 23-27, 1923.
165. SIMPSON, S. Effects of Thyro-Parathyroidectomy on Adult Sheep. *Proc. of the XIth International Physiological Congress*, held in Edinburgh, July 23-27, 1923.
166. SIMPSON, S. Some Effects of Thyroidectomy in Sheep. *N. Y. State J. of Med.*, December, 1923.
167. SIMPSON, S. Thyroparathyroidectomy in the Rabbit. *Proc. Soc. Exp. Biol. and Med.*, 1923, 20, 411.
168. SIMPSON, S., and LIDDELL, H. S. Neuromuscular Activity in Cretinoid Sheep. *Am. J. Physiol.*, 1923, 63, 406.
169. SIMPSON, S. Effects of Thyroidectomy on the Cutaneous System in the Sheep and Goat. *Quar. J. of Exp. Physiol.*, 1924, 14.
170. SIMPSON, S. The Effect of Thyroidectomy on Growth in the Sheep and Goat as Indicated by Body Weight. *Quar. J. of Exp. Physiol.*, 1924, 14.
171. SIMPSON, S. The Effect of Thyroidectomy on Growth in the Sheep and Goat as Indicated by Body Weight. *Quar. J. of Physiol.*, 1924, 14, 161-184.
172. SIMPSON, S. The Effect of Thyroparathyroidectomy in the Adult Sheep. *Quar. J. Exp. Physiol.*, 1924, 14, 199-207.
173. SIMPSON, S. Effects of Thyroidectomy on the Cutaneous System in the Sheep and Goat. *Quar. J. Exp. Physiol.*, 1924, 14, 185-197.
174. SIMPSON, S. The Effect of Thyroxin on the Cutaneous System in the Sheep. *Proc. from the Soc. for Exp. Biol. and Med.*, 1924, 21, 572-573.
175. SPEIDEL, C. C. Studies of Hyperthyroidism. I. Experimental Hyperthyroidism and the Germ Glands in Amphibians, with Special Reference to the Primitive Interstitial Tissue. *Anat. Rec.*, 1925, 31, 65-78.
176. STOLAND, O. O., and DONALDSON, L. Thyroid Tolerance Following Mild Experimental Hyperthyroidism. *Am. J. Physiol.*, 1925, 72, 184.
177. SUGATA, H. The Effect of Quinine on the Iodine Content of the Thyroid Gland. *Am. J. Physiol.*, 1923, 65, 282-286.
178. SWINGLE, W. W. Thyroid Transplantation and Anuran Metamorphoses. *J. Exp. Zoöl.*, 1923, 37, No. 2.
179. SWINGLE, W. W. Is the Tadpole Test for Thyroid Valid? *Endocrin.*, 1924, 8, 832-838.
180. SWINGLE, W. W., HELFF, O. M., ZWEMER, R. L. The Effect of Thyroxin and Its Acetyl Derivative on Amphibians and Mammals. *Am. J. Physiol.*, 1924, 70, 208-224.
181. TERAO, A., and WAKAMORI, N. Effect of Thyroid Feeding on Silk Worms. (Quoted from Physiological Abstracts, August, 1924.) *Jap. Med. World*, March 15, 1924, 4, reprint, 2 pp.
182. THOMPSON, F. D. *Phil. Trans.*, 1910.

183. TORREY, H. B. A Relation Between Experimental Hyperthyroidism and Barring in Poultry. *Proc. Soc. Exp. Biol. and Med.*, 1926, **23**, 536-537.
184. TRUKA, L. K vykonnemu vyznamu zlazy stitne a brzliku v zivotu fetalnim. (The Importance of Thymus and Thyroid Gland in the Foetus, with a Summary in French.) *Biol. Sp. Zverolik. Brno.*, 1924, **35**, 145-172.
185. TSUJI, K. On the Function of the Thyroid Gland, with Special Reference to the Effect of Variations of Diet upon It, I and II. (Quoted from Physiological Abstracts, September-October, 1923.) *Acta. Schol. Med. Kioto*, 1922, **4**, 471-480.
186. UHLENHUTH, E. The Secretion Granules and the Vacuoles in the Living Thyroid Gland. *Science*, 1925, **62**, 569-571.
187. UHLENHUTH, E. The Growth of the Thyroid and Postbronchial Body of the Salamander. *J. Gen. Physiol.*, 1924, **6**, 597-602.
188. VINCENT and JOLLY. Further Observations upon the Functions of the Thyroid and Parathyroid Glands. *J. Physiol.*, 1906, **34**, 295.
189. VINCENT, S. *An Introduction to the Study of Secretion*. Edward Arnold Co., London, 1924.
190. VINCENT, S. *Internal Secretion and the Ductless Glands*. Arnold, London, 1912.
191. VINCENT, S. The Thyroid Gland and Its Diseases. Physiology and Experimental Pathology. In *Endocrinology and Metabolism*, L. Barker, Ed., Appleton & Co., 1922, N. Y.
192. VON FELLENBERG, T. Über den Zusammenhang zwischen der Häufigkeit des Auftretens von Kropf und dem Iodegehalt der Umwelt. (Quoted from Physiological Abstracts.) *Biochem. Ztschr.*, 1924, **152**, 141-152.
193. WALTER, F. K. Über den Einfluss der Schilddrüse auf die Regeneration der peripheren markhaltigen Nerven. *Deutsche Ztschr. f. Nerven.*, 1909, **38**, 1.
194. WEGELIN, C., und ABELIN, J. Über die Wirksamkeit der Menschlichen Schilddrüse in Froschlärvenversuch. (Quoted from Physiological Abstracts.) *Arch. Exp. Path. Phar.*, 1921, **89**, 219-251.
195. WEGELIN, C., und ABELIN, J. Weitere Untersuchungen über die Wirksamkeit menschlicher Kröpfe im Kaulquappenversuch. (Quoted from Physiological Abstracts.) *Arch. Exp. Path. Phar.*, 1925, **105**, 137-168.
196. WEN-CHAO MA. The Mitochondria and Colloid in the Thyroid Gland of the Adult Albino Rat. *Am. J. Anat.*, 1925, **35**, 199-222.
197. WILHELMJ, C. M., and FLEISHER, M. S. The Effect of Administration of Thyroxin upon the Surface Tension of the Blood. *Proc. Soc. Exp. Biol. and Med.*, 1925, **23**, 79-80.
198. WILLIAMSON, G. S., and PEARSE, I. H. The Pathological Classification of Goiter. *J. Path. and Bacteriol.*, 1925, **28**, 361-387.
199. WILLIAMSON, G. S., and PEARSE, I. H. The Reticulo-Endothelial System in the Thyroid. *J. Path. and Bacteriol.*, 1925, **28**, 538-539.
200. WOODRUFF, L. L., and SWINGLE, W. W. Effect of Thyroid Products on Paramecium. *Proc. Soc. Exp. Biol. and Med.*, 1923, **20**, 386.
201. ZAVADOVSKY, B. The Effect of Feeding Fowls on Thyroid Gland. *Endocrin.*, 1925, **9**, 125-136.
202. ZONDEK, B. Untersuchungen über den Winterschlaf. (Quoted from Physiological Abstracts.) *Klin. Woch.*, 1924, **3**, 1529-1530.

## SPECIAL REVIEWS

- I. P. PAVLOV. *Conditioned Reflexes.* (Translated and edited by G. V. Anrep.) New York: Oxford University Press, American Branch, 1927. Pp. xv + 430.

This volume describes the work done in the Pavlov laboratories. It represents "the first complete discussion rendered out of the Russian into one of the more familiar European tongues." The volume consists mostly of a series of lectures delivered by Professor Pavlov in 1924 at the Military Medical Academy in Petrograd. Additional chapters deal with the experimental work which has been done since that date. A bibliography is appended which includes "all the published researches upon the physiology of conditioned reflexes" performed in Pavlov's laboratories. The names of ninety contributors are listed. The translator of the volume, Dr. Anrep, invoked the advice of his colleagues at University College, London, concerning the rendition of technical terms into English. The book is of special value in representing both a full and a first-hand account by Pavlov himself upon the many researches done in his laboratory which hitherto have been reviewed mostly by other writers. At the same time the ultimate value of the book becomes doubtful in consideration of the fact that it represents in an unadulterated fashion the purely Pavlovian viewpoint with no apparent recognition of contemporary criticism.<sup>1</sup> This scientific provincialism is hardly explained by Russia's partial isolation or by Pavlov's present advance in age. (He is now seventy-eight years old.) However, certain changes of opinion are noticeable. For example, in a footnote (p. 285) Pavlov says:

"Experiments which have been communicated briefly at the Edinburgh International Congress of Physiology (1923) upon hereditary facilitation of the development of some conditioned reflexes in mice have been found to be very complicated, uncertain and moreover extremely difficult to control. . . . At present the question of hereditary transmission of conditioned reflexes and of the hereditary facilitation of their acquirement must be left entirely open."

The subtitle of the volume is "*An Investigation of the Physiology of the Cerebral Cortex.*" Pavlov complains that the analysis of

<sup>1</sup>ANREP (*J. Physiol.*, 1920, 368) credits Pavlov with a "due regard" for H. M. Johnson's criticisms (*Behavior Monog.*, 1913), but such "regard" is not expressed in the present volume.

"the unbounded activity of the cerebral hemispheres" has been hindered by the mistaken belief in the existence of "special psychic activity." Pavlov, as usual, blames psychology for this mistaken belief.<sup>2</sup> Pavlov promises to follow the physiological trail, blazed by Descartes, in the idea of the reflex. While Magnus has shown the reflex nature of "all the elementary motor activities," Pavlov claims that most of the purely objective investigation into the highest nervous activities has been conducted in his laboratories; other laboratories have not gone beyond the limits of preliminary inquiry, and in America only a "small group of 'behaviorists'" have done purely physiological work. But Pavlov's position is not always clear, as when he says (p. 25): "A new reflex is formed inevitably under a given set of physiological conditions, and with the greatest ease, so that there is no need to take the subjective states of the dog into consideration." Upon the basis of this statement it would seem that Pavlov merely ignores rather than denies consciousness. This attitude might be consistent with his claims if it were not for the very teleological explanations and descriptions which he often gives for the behavior of his animals. For example, his substitution of an inborn "freedom" reflex and a "What is it?" reflex in place of instincts, his assertion about afferent impulses from bone injury "signalizing far greater danger" than skin injuries, his emphasis upon the necessity of an "alert state in the nervous system," and his interpretation of hypnotism as a "reflex of passive self-defense" seem to transcend the simple stimulus-response physiology which some of the more psychological laboratories have described.

A large number of experiments are described. Many are familiar, some are new. The subjects covered in the book are as follows: the concept of reflex and the variety of reflexes, conditioned and unconditioned; objective methods employed in the formation of conditioned reflexes; inhibition—external, internal, experimental extinction, delay of reflexes; the analyzing and synthesizing activity of the cerebral hemispheres; the identity of internal inhibition and sleep; pathological disturbances, functional and surgical; and the modification of some earlier interpretations. The experiments are concerned almost exclusively with the salivary reflex in dogs.

Concerning their laboratory technique, Pavlov says that he and his colleagues were often handicapped by the shortcomings of the instruments at their disposal, for they "always found that the cerebral

<sup>2</sup> Cf., *Science*, 1923, 359.

hemispheres were sensitive to far finer gradations of stimulus" than they could furnish. The slightest movement of the experimenter such as blinking of the eyes might serve as a stimulus. Of course, in the new laboratory (here only briefly described) the animal is put into a separate room during the experiments and conditions are controlled so rigidly that "accident plays no part whatever" and "the animal frequently can be kept under rigid experimental observation for one to two hours without a single drop of saliva being secreted independently of stimuli applied by the observer." Since most of the experiments antedate the building of the new laboratory, it is difficult to know what difference there is in precision between the old and the new data. This difficulty becomes serious in consideration of the very minute and exact discriminations for which the Pavlov dogs are noted, such as differentiating sound intensities with an interval of seventeen hours between the two stimuli (which were not distinguishable to the experimenter except in immediate succession), discriminating pitches of 800 and 812 d.v. and distinguishing a temporal interval of 0.024 seconds. Furthermore, this sensory acuity is often determined from surprisingly small variations of salivary flow, e.g., Speransky determined the relative strengths of four different stimuli, (a) metronome, (b) light, (c) whistle, (d) disc, by presenting each stimulus in order at about ten-minute intervals apart and measuring the salivation in drops per thirty seconds, thus:

a	b	c	d	a	b	c	d
8	5	8	5	9	5	8	6

A cortical state, called the *paradoxical phase*, altered these values in a subsequent series (with the stimuli presented in the same manner), thus:

a	b	c	d	a	b	c	d
4	6	4	7	4	2½	7	4½

Then, a later series showed a *phase of equalization*, thus:

a	b	c	d	a	b	c	d
7	5	5	4½	5	5	5	4

This is a fair example of the sort of quantitative data by which Pavlov proves his facts. These figures are supposed to show "definite transition stages of cortical activity." The present writer is unable to understand how Pavlov's work is never embarrassed with the probability of chance variation which must usually be heeded in biometrical work.

In Pavlov's discussion of the many varieties and ramifications of inhibition, he continues to express the belief that there are definite "inhibitory reflexes" (which may develop from strong or weak stimulation or from an absence of stimulation). He believes that there may be a "transition of the cortical cells into an inhibitory state."

A fourth of the book is concerned with pathological states which are developed either from functional causes or from surgical extirpations. The functional neuroses depend upon the type of temperament displayed by the dogs. There are four types: "sanguine," "melancholic," "phlegmatic," and "choleric" (!). These four are grouped into two outstanding classes: (1) the nervous EXCITATORY type, which must receive many varied stimuli in quick succession if good results are to be gotten, and the "biologically unprofitable tendency" of general inhibition (*i.e.*, sleep) is to be prevented, and (2) the timid INHIBITORY type, which maintains high constancy of response especially with delayed and inhibitory conditioned reflexes. The proper type of dog must be chosen for a given experimental setting or else a neurosis will result. Functional pathology also develops when the limits of discriminability are reached in certain tests, *e.g.*, between a circle and an ellipse with a 9-8 ratio of the semi-axes, at least if unsuited dog temperaments are involved. From the experimental results obtained with the animals Pavlov suggests an application to man, namely, that the two, EXCITATORY and INHIBITORY, types of temperament represent an analogy to the two forms of human neuroses, *neurasthenia* and *hysteria*.

Pavlov's physiological explanations are stated almost solely in terms of cortical cells and centers. As an illustration, in the case of reflexes conditioned to "automatic stimuli," *e.g.*, when a dog becomes conditioned to hypodermic injections of morphine so that the mere sight of the experimenter arouses nausea, the "symptoms are now the effect, not of the morphine acting through the blood stream directly on the vomiting center, but of all the external stimuli which previously had preceded the injection of morphine."<sup>3</sup> Pavlov con-

<sup>3</sup> Experiments by Podkopaev and Krylov cited. This particular response is the "Collins-Tatum reflex," so called by Kleitman and Crisler (*Amer. J. Physiol.*, 1927, 571), who credit the discovery to K. H. Collins and A. L. Tatum (*ibid.*, 1925, 14). But Podkopaev published in 1924, according to an abstract in *Zentralb. f. d. ges. Neur. u. Psychiat.* (1925, 214). Since Pavlov gives no bibliographical reference in his text, and the content of the appended bibliography is arranged differently than the text, outside sources of reference are needed in order to identify Pavlov's citations. But the outside sources

tinues: "Any unconditioned, or firmly established conditioned, stimulus undoubtedly evokes a state of nervous activity in some definite part of the brain. Using the generally accepted terminology, let us refer to such areas of the brain as centers, not however thereby implying any idea of anatomical localization. During the period of excitation of such centers all other stimuli which happen to affect the animal are conducted to these centers, and the paths by which they are conducted through the hemispheres become thereby specially marked out. This is the only possible interpretation of the facts, and upon this interpretation was planned the series of experiments with apomorphine which have just been described as corroborating so thoroughly with the experiments of Dr. Krylov with morphine." Furthermore, Pavlov prefers to believe that "stimuli which lead to activity of an organ gain direct representation in the cortex independently of the simultaneous excitation of a subcortical area," at least "in the intact brain when the hemispheres are in a state of alertness." With the *trace reflex* and the reflex conditioned for periodic recurrence (*e.g.*, the salivation conditioned for every 30th minute which would not respond to the conditioned stimulus on the 29th minute) Pavlov supposes that the physiological registration of time depends on definite cyclic changes of internal organs which are reflected in the cerebral hemispheres. In his report upon a partial extirpation of the cortical part of the cutaneous analyzer, Pavlov gives a characteristic example of his type of observation and interpretation:

"One and a half months after the operation a vigorous attack of convulsions occurred. During this attack the animal was subjected to a further operation, the scar, which gave outgrowths considerably beyond the site of the original lesion, being carefully removed. The convulsions did not recur after the operation, but another form of disturbance developed which lasted at each recurrence for several days. When either experimenter or food came into the field of vision of the left eye (the animal being operated (whether German, French or English) are seldom the same as those given in Pavlov's bibliography. Anrep (*Physiol. Abstracts*, 1922-23, 414f.) says: "Those interested in conditioned reflexes should consult the French translation of the *Proc. Russ. Physiol. Soc.*" This periodical is never mentioned in Pavlov's bibliography, but in its place the *Russian Jour. Physiol.* is cited. Pavlov also refers frequently to the *Archive of Biol. Sciences*. The titles of these last three periodicals are transliterations, but the *Proceedings* and the *Archive* cannot be identified with anything in either the *Union List of Serials* (1926) or the *World List of Scientific Periodicals* (1900-1921).

on the right side) it quickly turned away, and if free ran away, showing signs of extreme excitation. The same stimuli when applied from the right side of the animal produced no abnormal reaction. Often, free and on its own, the dog would suddenly glance to the left, quickly jump up and run madly away. This can all be interpreted if we assume that some remaining portions of the scar directly irritated the visual analyzer on one side, thereby producing a distortion of the effect of the external stimuli falling on the retina and altering the significance of the visual object, which assumed in the dog's cortex unusual and extraordinary aspects to which the animal reacted as to any concrete and definite stimulus—exactly in the same manner as happens also with normal animals in response to any extraordinary stimulus. In short, the scar produced a phenomenon of illusion" (p. 327).

Pavlov has presented a veritable broadside of detail which fits systematically into his idea of "the cortex as a mosaic of functions." The present writer thinks that Pavlov has created a salivary phrenology, that he has developed a vicious circle wherein salivary units supposedly correspond to nervous units and, consequently, that he has not answered the general criticism that his units cannot produce "situations." When he does attempt to produce situations he verges on the anecdotal in a way that brings relief to the psychologist that his science has been repudiated by Pavlov. The book assumes its highest value as a profound historical document.

W. S. HULIN.

*Princeton University*

H. L. HOLLINGWORTH, *Mental Growth and Decline. A Survey of Developmental Psychology.* New York: Appleton, 1927. Pp. xii + 396.

Intended as a survey for the college student, general reader, and prospective teacher, this book is an excellent introductory survey of developmental psychology, the first of its kind. It makes interesting reading and is amply illustrated with experimental literature.

Here is a remarkable synthesis of the author's past contributions to psychology. Projected on the screen of developmental psychology are the main features of the drug experiments, judging human character, functional neuroses, thought. The basic idea of reintegration is woven into different parts of the book. It is the mechanism accounting for development of speech, thought, meaning, emotional gradation and the various parts of "mental" life.

Professor Hollingworth succeeds in chaining the mind to the past. He nowhere refers to James' comment on the original conception of Hamilton, nor mentions Hodgson's law of interests. For James, redintegration meant that "the panorama of the past, once opened, must unroll itself with fatality to the end, unless some outward sound, sight, or touch divert the current of thought."<sup>1</sup> Perhaps an escape from this restrictive outlook lies in a "futuristic redintegration" which establishes the cues of present situations not only on the basis of past situations but previous "future" situations. Utopias, ideals, visions, imaginative pictures of the future become cues for reactions to present situations.

The Hollingworthian method is synthetic. Antagonistic on the one hand to "animistic" and "dramatic" interpretations, it is not averse to using certain concepts under certain conditions. All the chapters are syntheses of variegated opinions and conclusions. Rivers' case of claustrophobia is restated in simple terms, the original repression, complex, suppression interpretations having been eliminated. This is the first time that the famous claustrophobia case has been stated in this manner. Again, the theory of emotional gradation of the author bears a striking semblance to Rivers' theory of human instincts as protopathic, ungraded with cortical inhibitions making possible epicritic, graded behavior.

Based on Shakespeare, Kirkpatrick, Thorndike, Berman, the writer's significant ages of man are ten: germ-plasm, foetal, infant, babyhood, questioning, "big Injun," "the awkward," maturity, senescence, "post-mortem" stages in development. These periods are methodically treated under the rubrics of intelligence, interests, physical development, general behavior characteristics, play, language, special developmental influences, mental adjustments which physical changes involve, individual differences, socialization, vocation, education, clothing, property, the family. Hollingworth sketches the periods of life; his canvases have very few details. This book is unlike Hall's Adolescence; it is general and specific on a very few points only. The average man is skilfully portrayed. But, the explanation of the development of the will, of voluntary-control is not convincing and rather very incomplete. The reviewer understands that a systematic treatment of psychology from the viewpoint of redintegration is being written by Professor Hollingworth which will develop in detail his general theory.

<sup>1</sup> *Principles*, Vol. I, p. 569.

Included in the chapter on senility is a novel set of developmental curves. A suggestion is made that these purely imaginative curves will become in time scientific. The author has probably in mind a mathematical representation of mental growth and decline. Indeed in the course of time psychological measurements may furnish the data for developmental curves that will serve for prediction purposes.

Three classic chapters on abnormal development, social development<sup>2</sup> and normal development conclude the book. The chapter on abnormal development is an epitome of the author's viewpoints in abnormal psychology. For the first time he has published his theories of functional disorders. His criteria of functional disorders as conditions caused by or constituting emotional stress, habit residuals, symptoms rendered vivid by suggested attention, cherished defense symptoms, compensatory reactions, dissociated states, redintegrative reactions apply apparently to the psychoses and psycho-neuroses. These criteria synthesize modern psychopathology doctrines in a simple, scientific manner. It is an invaluable contribution to abnormal psychology. Its bearing in psychology and medicine is unlimited. The "post-mortem" age is regarded as the duration and persistence after death of the individual's influence on social institutions. The last chapter is the capstone of the book for it summarizes the various principles of development. Here again the synthetic method is evident. For Hollingworth's twenty-three laws of normal development include Spencer's formula, the law of recapitulation, law of germinal continuity, developmental asymmetry, creative synthesis, redintegrative substitution, involution and regression, fixation, inhibition, developmental pace, compensation, stimulation range, habit and inertia, joint influence, selection.

NATHAN ISRAELI.

*Columbia University*

EDMUND S. CONKLIN. *Principles of Abnormal Psychology*. New York: Henry Holt and Company. Pp. vii + 457.

This textbook is designed especially for the advanced undergraduate student in psychology. Doubtless it is an interesting elementary introduction to the major problems of abnormal psychology. Although Professor Conklin has endeavored to "hold to a detached attitude on the theories and interpretation presented" as stated in the Preface, his position is not clear-cut at times. Apparently, the

<sup>2</sup> Perhaps a future author will include a chapter on "abnormal social development."

author clings rather tenaciously to psychoanalysis. In fact, this book is really an introduction to Freudianism and could be so entitled.

The first chapter discusses the essential requirements for normal development and then plunges the student directly into psychoanalysis. The author laconically remarks that it "should always be remembered that it is a theory and but one of the many theories of the sub- or unconscious." James' theory of hallucinations takes up part of the second chapter. Chapter three is on memory abnormalities and attributes shell shock cases to "disturbances of an amnesic nature."

Chapters IV and V cover the psychoses. The causes of delusions are given as fatigue, worry, emotions, complex, introversion, extraversion. Distorted thinking (paranoia) is explained in terms of psychoanalysis, although the author fails to allude to Woodworth's classic psychological analysis of paranoia, which renders superfluous any such explanation. (*Dynamic Psychology*, 1918.)

Chapters VI and VII are devoted to the psychoneuroses and set forth the points of view of Janet, Babinski, and psychoanalysis. The remark is made that "any of the basic emotions or instincts of life should be considered a possible source of complexes and of hysteria and this without rejecting the remainder of the psychoanalytic method." The author fails to treat of Professor Hollingworth's empirical synthesis of these same viewpoints on the basis of reintegration. (*Psychology of Functional Neuroses*, 1920.)

Chapter VII, "Shell Shock," explained at length through the theory of psychoanalysis. Hollingworth's contributions to the study of shell shock is not mentioned. There is no mention either of the Woodworth Psychoneurotic Inventory devised for detection of emotional instability and prevention of shell-shock cases. No emotion tests are alluded to.

Chapter IX, on multiple personality, states that not more than fifty cases of multiple personality are known to science. The Beau-champ case is interpreted as due to failure of repression.

Chapter X tells how the complex is discovered by dream analysis, free association, crystal gazing, automatic writing, hypnosis. The following chapter discusses the "results of analysis": applies the criterion of regression to cases of psychoneuroses, explains delusions in psychoses as rationalizations, takes up the Freudian concepts of flight from reality, displacement of affect, projection, introjection, regression, symbolization, autistic thinking, dreams, abreaction, reeducation, transference.

Chapter XII interprets hypnotism along the historical lines as suggestion, artificially induced sleep, subconscious, artificially induced hysteria, and as a "release of the childish affective habits and the unresolved conflicts so that the phenomena of hypnosis are really motivated by this pent-up emotional life."

Chapter XIII, on spiritistic phenomena, tells about the tricks of mediums, about the ouija-board, the planchette, automatic writing, telepathy, telesthesia, telekinesis, crystal gazing, ghosts, dowsing, and explains the ouija-board on the basis of psychoanalysis.

Chapter XIV, Sleep and Its Abnormalities. Theories of sleep, abnormalities of sleep, effects of loss of sleep, insomnia, partial sleep, and night terrors are dealt with. The author's approach wavers at times. In treating of partial sleep it is said that such "phenomena, when they occur, can be explained without resorting to the assumption of a subconscious self which sits on guard while the conscious self sleeps."

Chapter XV, an interesting discussion of dreams. The psychoanalytic bias again outcrops, for the author says that "the psychoanalysts may nevertheless be correct." A convergence of the viewpoints of psychoanalysis and experimental psychology on dreams is visioned. Relation of dreams and psychoneuroses on Janet's and Freud's interpretations is shown.

Chapter XVI, Mental Effects of Drugs. The use of alcohol is attributed to a flight-from-reality on the basis of G. T. W. Patrick's idea of the development of the use of alcohol as due to the necessity for relaxation from the strain of modern civilization. In one place Patrick, however, wrote: "This desire for narcotics and stimulants is probably a symptom of an overdeveloped and overstimulated brain. It indicates a lack of adjustment between body and brain—too much work and not enough play"—which is hardly a flight-from-reality interpretation. Experimental work of Hollingworth and Fernberger is cited; psychoanalysis of drug habits suggested.

Chapter XVIII treats of feeble-mindedness and genius. The reader is urged that it is probably necessary to suspend judgment on the question of the causal relation between heredity and feeble-mindedness. Genius is psychoanalyzed.

A chapter on the biographical and historical background concludes the book. The last words of the author criticize Kraepelinian psychiatry and point to psychoanalysis as the solution for the enigmas and dilemmas of abnormal psychology as the future basis for a "more satisfactory classification of mental diseases."

It is evident that this textbook does not present the facts covered from a detached attitude. The advanced undergraduate cannot but turn psychoanalyst. If the author were bent on a neutral attitude he would have discussed the other points of view. He has instead written a treatise in psychoanalysis with a maximum of theoretical considerations and a bare minimum of data. Experimental literature is not too often included. Kraepelin's lifelong experimental work scarcely receives mention even. Indeed, an unbiased account would not skip over the contributions of Sidis, Woodworth, Dunlap, or Hollingworth. The importance of these men warrants a sketch of their critical attitudes.

Thus, in 1914, did not Boris Sidis trace the relation between Freudianism and the concepts of Herbart and refer to William James' comment that "I must confess that to my mind there is something almost hideous in the glib Herbartian jargon about *Vorstellungsmassen* and their *Hemmungen* (suppressions) and *sinken* and *erheben* and *Schweben* and *Verschmelzungen* and *Complexionen* (complexes)"? Sidis pointed out also the logical absurdity and meaninglessness of the "unconscious consciousness," which is comparable to the concept of a "round square." Knight Dunlap six years later also emphasized the illogicality of this basic concept of psychoanalysis.

While in a footnote the author refers to "Some Criticisms of the Freudian Psychology" (*Jr. Abn. and Soc. Psy.*, 1917-18, 12, 174-194) as a "very complete and valuable criticism of psychoanalytic technique and assumptions," he does not include a treatment of this criticism. It will be recalled that Professor Woodworth then wrote that "their methods, considered as means of demonstrating psychological facts, seem to me excessively rough and ready, and their conclusions one-sided and exaggerated"; and summed up his arguments with the comment that "I do insist that this analysis constitutes a reduction *ad absurdum* of the Freudian theory."

Professor Conklin attempts to apply psychoanalysis to the famous Beauchamp case. He forgets to mention that Morton Prince warned that this "interpretation or theory of dissociated personalities . . . is opposed to present day attempts . . . to refer the phenomena of the psychoses to a single subconscious motive, a wish, whether sexual or one to 'escape from reality' (so-called defense reaction) or some other. . . . In the alliance of psychological dispositions, the conception of a primitive unconscious or other desire, sitting apart and underneath, as an 'anima' or 'animus' . . . in an unconscious puddle . . . pulling the wires and directing the dynamic

forces, of organized systems constituting personality, both 'shocks the imagination' and is, to my mind, untenable." (*Jr. Abn. and Soc. Psy.*, 1920-1921, 15, p. 134.)

This textbook covers the same ground as the *Outline of Abnormal Psychology*, although the organization is different. MacDougall's book, despite its brilliant attempt to explain the concepts of psychoanalysis on the basis of the instinctive dispositions and physiologically by that writer's favorite drainage theory, is a destructive criticism of all these concepts with a few compromises of doubtless value. Professor Dunlap has recently referred to his own *Mysticism, Freudianism, Scientific Psychology* (1920) as a "paean of praise" in comparison with this critical destruction of MacDougall.

NATHAN ISRAELI.

*Columbia University*

KIMBALL YOUNG, *Source Book for Social Psychology*, N. Y.: Knopf. 1927. Pp. xvii + 844.

This exceedingly interesting and valuable collection of original sources contains reprinting of two hundred and twenty-nine assignments from various pens on a wide range of topics included in social psychology. The book is divided into six parts and twenty-seven chapters.

In Part I is considered the general features of social behavior such as evolution and prehuman social life, types of social groupings, cultural standards; in Part II, the discussion is confined to the psychological foundations of social behavior, and it is in this chapter that writings of psychologists are most frequently found; in Part III the question of personality and social behavior is discussed; while in the next part social attitudes and subjective environment is treated; Part V is concerned with leadership and prestige in social behavior; and the last part with collective behavior.

It is the reviewer's opinion that the selection has been well made and interestingly analyzed and grouped and that the book should be of considerable interest not only to psychologists but also to sociologists and others.

SAMUEL W. FERNBERGER.

*University of Pennsylvania*

JAMES H. S. BOSSARD, *Problems in Social Well-Being*. N. Y.: Harpers, 1927. Pp. 654.

Bossard analyzes three major problems that are of importance for social well-being and for social adjustment: standards of living,

physical hygiene and disease, and mental hygiene. It is this last problem which will be of especial interest for psychologists. The problem of mental deficiency and its social significance is recognized as exceedingly important as will be evident, inasmuch as the author gives some 150 pages to its discussion. In this he considers scales and classification of deficiency, causes of mental deficiency and an interesting review of early and recent training experiments with the mentally deficient. Finally he evolves a program for handling the problem, all of the essentials of which must be complied with if our social control of the mentally deficient is to be at all adequate. This program involves: (1) identification, (2) registration, (3) special classes in the schools, (4) supervision, (5) institutional care, (6) colonization, (7) parole, and (8) segregation.

In some chapters in mental diseases and their social significance these problems are treated with a strong leaning toward the Freudian doctrine. The last part of the book deals with changing backgrounds and conceptions for social well-being. It is pointed out that modern civil society has lead to much greater individualization than was true only a few years ago. An attempt is made to outline the "set-up" in the United States. Throughout the author insists that the great needs are, first of all, a scientific approach to the problems and, secondly, the need for facts.

The book should prove of great interest to psychologists in pointing out the social significance of the findings of the clinical group and in bringing out the relation of their facts to the general problems of sociology.

SAMUEL W. FERNBERGER.

*University of Pennsylvania*

EDWARD M. EAST. *Heredity and Human Affairs*. N. Y.: Scribner's, 1927. Pp. vii + 364.

The author calls this a simple introduction to genetics, but it is really much more than this. It not only explains the mechanics of heredity but goes on to sketch the implications of "biological determinism" for society in general. It is broad and sweeping in its conclusions, but it is delightfully written. It stimulates one to think, even if one does not agree absolutely with all the author's generalizations.

After giving a general description of the machinery of heredity and the principal facts known at the present time with reference to the inheritance of human traits, the author discusses such problems

as marriage between near kin, various racial problems, particularly the negro problem in this country, genius, mediocrity and education, immigration and social hygiene. The discussion of the relation between heredity and environment is particularly good. With reference to feeble-mindedness, it is taken for granted that feeble-mindedness is a unit character and Goddard's results on the inheritance of this trait are accepted unqualifiedly. The author is prone to take Goddard as his authority without question on matters of mental testing, as for example in his statement that about 50 per cent of the inmates of our penal institutions are feeble-minded. The work of Terman, Cox, Kelly, and other psychologists is cited in reference to the problems of education. Altogether the book presents a very fair and extremely interesting account of genetics and its implications for social welfare.

R. PINTNER.

*Teachers College, Columbia University*

## BOOKS RECEIVED

GEORGINA S. GATES, *The Modern Cat. Her Mind and Manners. An Introduction to Comparative Psychology.* N. Y.: Macmillan, 1928. Pp. ix+196.

SANTE DE SANCTIS, *Religious Conversion. A Bio-Psychological Study.* (Trans. by Helen Auger.) N. Y.: Harcourt, Brace, 1927. Pp. 324.

KIMBALL YOUNG and RAYMOND D. LAWRENCE, *Bibliography on Censorship and Propaganda.* Univ. of Oregon Pub. (Journalism Series), Vol. I, No. 1, 1928. Pp. 133.

COLEMAN R. GRIFFITH, *General Introduction to Psychology. A Survey of the Programs of Psychology.* (Revised Edition.) N. Y.: Macmillan, 1928. Pp. xix+607.

JOHN B. WATSON, *Psychological Care of Infant and Child.* (With the assistance of Tosalie R. Watson.) N. Y.: Norton, 1928. Pp. 195.

*Alphabetical Index and Numerical List of United States Government Master Specifications Promulgated by the Federal Specifications Board.* (Complete to January 1, 1928.) Circular of the Bureau of Standards, No. 319. Washington: Gov't Printing Office, 1928. Pp. 18.

W. S. TAYLOR, *Morton Prince and Abnormal Psychology.* N. Y.: Appleton, 1928. Pp. xi+137.

## NOTES AND NEWS

IN place of the existing department of philosophy and psychology at University College, London, a department of philosophy and a department of psychology have been instituted. Professor C. E. Spearman, now Grote professor of philosophy of mind and logic, will be head of the department of psychology, his title being changed to professor of psychology in the University of London.

PROFESSOR WARNER BROWN of the University of California has been elected member-at-large of the Division of Anthropology and Psychology of the National Research Council.

DR. JOHN P. NAFE has been promoted to professor of experimental psychology at Clark University.

AT the recent annual meeting of the National Academy of Sciences, Dr. George M. Stratton and Dr. Lewis M. Terman were elected to membership.

COMPARATIVE PSYCHOLOGY MONOGRAPHS have been taken over by the Johns Hopkins Press, and will be issued hereafter under the managing editorship of Knight Dunlap. The Board of Editors consists of J. E. Anderson for child psychology; H. A. Carr for the lower vertebrates; W. S. Hunter for general human problems; A. V. Kidder for racial studies; S. O. Mast for invertebrates; and R. M. Yerkes for the primates. Manuscripts offered will be referred to the appropriate editor immediately, and will be considered for publication only after being approved by him.

BIRD T. BALDWIN, Research Professor of Educational Psychology and Director of the Iowa Child Welfare Research Station at the University of Iowa, died on May 12. Professor Baldwin has been connected with the BULLETIN for a number of years as Co-Operating Editor in charge of the field of child psychology.

21

vo

H

HO

G.  
son  
Mi  
Mi  
UN

Ge

No

B